VETERINARY MEDICINE

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features in this issue...

Free-Choice Phenothiazine on Incidence of Cattle Grub

Role of Cultures in Examinations for Trichomonas foetus

Cadmium Anthranilate as Swine Ascaricide

Bovine Mastitis: I Pathogenicity Testing of Micrococci

Oxygen Device for Open Chest Surgery in Dogs

Filariasis in A.F.P. War Dogs

Amputation in Chinchilla

X-ray Exposure Factors

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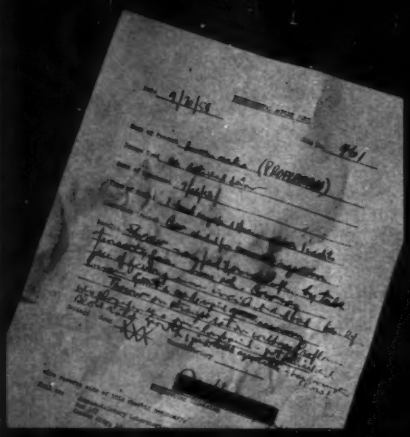

case report 461 | **toxic indigestion** (ingestion of placenta)

A practitioner in Southern Ohio sends us this case report involving use of PROFLORAN in treatment of toxic indigestion in a valuable dairy cow. On arrival at client's farm, he was told that the patient had calved recently, and had eaten the placenta. The animal's temperature was now 107°. She had not eaten for several days and her condition was generally quite toxic.

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Mortality and Morbidity Reports

A number of states have assumed initiative in assembling animal mortality and morbidity statistics. In these instances, discussions continue, but action has been taken and reports, though generally incomplete and fragmentary, nevertheless are proving of value. With cooperation of practitioners these will prove of increasing value to all concerned, not the least of whom will be the practitioners themselves who contribute the information contained.

Certainly no progress can be made by talking mortality and morbidity reports—a start in preparing them will prove or disprove their worth.

Losses in Agriculture

Concern has been expressed by many authorities about the expected 25 to 40% population increase by 1975, estimated by the Bureau of Census. Losses in Agriculture, a 190-page, paper-bound book published by the Agriculture Research Service of the USDA, analyzes hazards and losses to crops and livestock. Here is revealed the many sources of losses of food, feed, and fiber, and their value expressed in acreage equivalents. Here also is stated that, "If full production could be attained on the acres lost because of hazards to crops and livestock, we could expect to raise more than sufficient food, feed, and fiber for the increased population anticipated by 1975." Here lies a most fertile field for development. New research is needed to devise methods of preventing loss, and more effective technics are necessary to assure these methods being employed.

Plan to Attend Your State Meeting This Year

Attendance at state meetings in every section of the country has been increasing yearly. This healthy sign of growth and interest of practitioners in self-advancement, and in group activities, is expected to continue with a 100% cooperation as a goal.

Plans now being prepared by state secretaries and appointed program committee chairmen include assurances that greater numbers can be housed comfortably during meeting dates and that discussions treat subjects of interest to all.

Attend your state and regional meeting this year. It will be of mutual benefit to you and organized veterinary medicine in your state.

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Effects Of Free-Choice Ingestion Of Phenothiazine On The Incidence Of Cattle Grub, *Hypoderma Lineatum*

BENJAMIN SCHWARTZ,* Ph.D., DALE A. PORTER,** Sc.D., and HARRY HERLICH,** M.S.

THE currently recommended methods for controlling cattle grubs, Hypoderma spp., involving the application of rotenone in sprays, washes, or dusts, have two major weaknesses, as follows: (1) To obtain effective results from treatment requires the cooperation of every cattle owner in the area in which the control measures are being applied, and (2) their application does not preclude damage to the hides of the animals involved in the control program. As a matter of fact, treatment is begun after the grubs have reached the backs of the cattle and punctured holes in the skin (see fig. 1). It certainly would be more desirable to attack this pest from an entirely new angle, if possible, and in a manner which would be effective in preventing the parasites from reaching the back. If this could be done safely, and on a practical basis, it would eliminate the loss due to damaged hides and the devaluation of meat cuts as a result of trimming the loins to remove the parasites and associated lesions.

Various researchers[1,2,3,4,5] have reported on the use of chemical agents as systemic insecticides for the control of external, blood-suck-

Fig. 1. Spraying cattle in chute with rotenone spray to destroy the grubs after they have punctured holes in the skin.

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ing parasites. Mocsy[9] was able to control scabies in dogs and swine, and lice in swine and cattle, by peroral administration of contact poisons. According to a recent report[7], subcutaneous injections of aldrin and lindane into cattle at a rate of 50 mg./kg., and of dieldrin at a rate of 25 mg./kg., killed most of the grubs in the backs of cattle. A few larvae

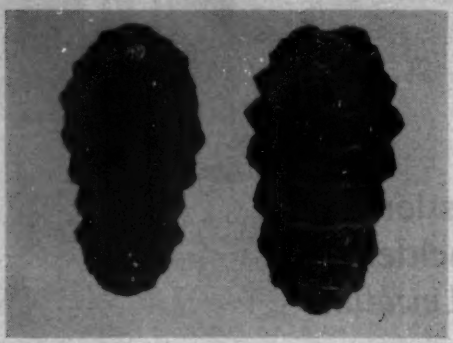

Fig. 2. Photograph of common cattle grub, Hypoderma lineatum. Figure on right is of a grub just after emergence from its subdermal cyst on the back; that on the left is of a pupa on the ground.

which survived failed to pupate and produce flies. Recently, Leiper[9] noted that there was not a single case of tail-strike in lambs dropped by ewes dosed with phenothiazine ten days prior to lambing and continued on low-level phenothiazine for nine weeks thereafter. On the other hand, six of 22 lambs dropped from untreated ewes were struck. Knipling[9] and Bruce[10] showed that phenothiazine fed to cattle destroyed the larvae of the horn fly in manure, presumably because the animals' droppings contained enough of the drug to kill the maggots.

In view of the fact that phenothiazine has been tested and used as a larvicide, and that the drug is known to be absorbed into the blood stream of treated animals, one of us (B. S.) suggested that perhaps phenothiazine or one of its metabolic products might be detrimental to, or even kill, cattle grubs during their long larval life. At the time this suggestion was made in December 1952, investigations were in progress at the U. S. Regional Animal Disease Laboratory on the control of internal parasites of cattle by free-choice ingestion of phenothiazine in a mineral mixture[11]. Accordingly, an examination was made of the grub (*Hypoderma lineatum* fig. 2) population in six steers used in that work. The results of these observations were sufficiently encouraging to warrant further determinations on the effects of free-choice ingestion of phenothiazine for the control of internal parasites, including also cattle grubs. The data so collected, together with an interpretation of the facts, are herein reported.

While these observations were in progress during the second year, Worden[12] reported successful control of grubs by treating cattle with a preparation containing phenothiazine, hexachlorethane, and an organic tin compound, the three drugs being indicated for the control of gastrointestinal nematodes, liver flukes, and tapeworms of cattle in one treatment. The medication was administered in mid-January and again in early March, and in a second trial treatment was given at the beginning of the months of December, January, and February. Spence,[13] who also tested phenothiazine for grub control, reported no difference between treated and untreated cattle, as regards the incidence of Hypoderma in a herd in which half of the calves, yearlings, and mature cattle received doses of 7.5, 15 and 20 gm. of phenothiazine, respectively, at 15-day intervals, the remaining portion of the herd serving as controls.

Fig. 3. Steer pursued by heel fly. Animal photographed while running to escape from flies.

Procedure

The first observations were made in the winter of 1952-1953 on six grade Jersey steers which had been used in studies on the effect of free-choice administration of phenothiazine on nematode parasites of cattle[11]. Three of the steers had access to a medicated mineral mixture consisting of three parts of bonemeal, limestone, and salt, and one part phenothiazine, whereas the three controls had access only to the unmedicated mineral mixture. Subsequent to these studies, after the

grub season, the steers continued on the same regimen on other pastures.

In the experiment conducted during 1953-1954, five of the cattle used the previous year —one of the three controls having been killed December 22, 1952—as well as a replacement animal, were involved in one group, and six in another, making a total of 12, of which six were principals and six controls. One group was on a pasture which was separated by a fence into two equal parts. The three steers which previously had been the test animals continued as such and had access to the phenothiazine-mineral mixture on one-half of the pasture, and the remaining three served as nonmedicated controls on the other half. In addition, observations were made on six other calves grazing two pastures designated here as A and B. These calves had been used previouly in the free-choice experiments aforementioned[11]. Three calves on pasture A had access to the phenothiazine-mineral mixture, whereas the three on pasture B served as concontrols and had access to the nonmedicated mineral mixture. On October 26, 1953, it became necessary to feed grain and phenothiazine was mixed, therefore, with the grain in sufficient quantity to insure an average daily intake of 2 gm. of the drug per head.

All animals were examined by palpation weekly, and records kept of the numbers of grubs so detected. Examinations were continued until no more parasites were found.

Two facts make clear the necessity for a new and more efficient approach to control of cattle grubs: (1) Currently recommended treatment does not prevent hide damage in the animal treated, and (2) lack of cooperation of some doom area adult fly control programs.

The method outlined herewith, or something like it, certainly is more practical. This approach considers the importance of attack on these parasites before they damage prime meat cuts and hides.

Results

Table 1 gives the data pertinent to the trials made in two years, and shows the period during which phenothiazine was available, as well as the numbers of grubs that were detected in the backs of the principals and controls.

1952-1953. The test animals consumed an average of 0 to 3 gm. of phenothiazine per head daily, as previously recorded[11]. No grubs were detected in steer 1242 or in its control, 1248. This may be explained by the fact that these two animals were in portable pens first and in a barn later, until May 5, 1952, and were not accessible to the heel flies. Observations made at Auburn, Alabama, indicated that maximum fly activity occurred during the months of February, March, and early April (see fig. 3). Of the four steers which were exposed to strike, the two treated ones had an average of only 5.5 grubs, whereas the controls averaged 41 grubs, the ratio being approximately 1:8. It should be

TABLE 1. Number of Grubs, Hypoderma lineatum, Observed in Cattle Ingesting Phenothiazine and in Comparable Controls

Animal no.	Birth date	On pasture	Dates drug was available	No. of grubs found 1952-1953	1953-1954
1217	10-11-50	7-30-51	7-30-51 to 1-11-54	0	8
(1218)[1]	11-23-50	do	———	20	28
1231	5-31-51	10-11-51	10-11-51 to 6-30-52 12-22-52 to 1-4-54	11	14
(1226)[2]	4-13-51	do	———	62	—
(1238)[2]	8-23-51	12-22-52	———	—	35
1242	10- 1 -51	5- 5 -52	5-5-52 to 1-11-54	0	11
(1248)	10-17-51	do	———	0	57
1270	7-31-52	12- 1 -52	12-1-52 to 12-16-53[4]	—	16
(1268)	7-31-52	do	———	—	44
1286	9-29-52	3- 9 -53	3-9-53 to 2-18-54[4]	—	0
(1285)	9-22-52	do	———	—	24
1281	9- 1 -52	1-19-53	1-19-53 to 12-16-53[4]	—	0
(1282)	9-12-52	do	———	—	28
			Treated Total	11	49
			Control Total	82	216

[1]Unmedicated controls in parenthesis. [2]Killed 12-22-52. [3]Replacement for 1226. [4]Phenothiazine mixed with grain from 10-26-53 to 12-16-53.

noted that treatment was discontinued on animal 1231 on June 30, 1952, six months before appearance of 11 grubs in its back. By way of comparison, 62 grubs were found in one of the untreated control animals, 1226. The number of animals involved in these observations was obviously too small for valid statistical analysis.

1953-1954 trials. The cattle that had access to phenothiazine consumed an average of 0.1 to 2.7 gm. per head daily. Grubs began to appear in the backs of these animals in November, and all had dropped out by the end of February. The greatest number reached the back during December. Treatment was discontinued during the period December 16, 1953, to February 18, 1954, (table 1). The number of grubs detected in the six treated steers ranged from zero to 16 per head, whereas the six controls had from 24 to 57 each. The treated group averaged eight grubs per head whereas the controls averaged 36, the ratio being 1:4.5. The standard error being 5.8, the average difference of 28 grubs per head is highly significant at the 1% level. Of special interest is the fact that all controls were infested, whereas two of those medicated (1281, 1286) were entirely free.

In view of the report[7] that a few grubs survived injections of aldrin, dieldrin, and lindane, and that these larvae failed to produce flies, we attempted to determine whether phenothiazine might have exerted an injurious effect on the grubs. Treated steer 1242 and control 1248 were moved to stanchions in a concrete-floored barn on January 25, 1954, after being off the mineral mixture since January 11, a period of two weeks. Of the 17 grubs that remained in the back of untreated steer 1248, after it had been placed in a stanchion, six were subsequently picked up from the floor for further study. All pupated, with flies emerging from two pupae. Of 11 grubs in the back of treated steer 1242, ten were picked up, and all pupated, with flies emerging from five. All grubs had dropped out by February 11, those not picked up having been stepped on by the animals. There was no difference in the rate of emergence of flies from the two steers under observation. These results suggest that phenothiazine had no deleterious effect on the larvae which survived the medication.

Summary

Observations are reported in which the free-choice administration of phenothiazine appeared to effect a reduction in the number of grubs reaching the backs of cattle medicated free-choice with phenothiazine, as compared to comparable nonmedicated controls. In the first trial, three controls had a total of 82 grubs, and three medicated ones had a total of only 11. In the second trial six controls averaged 36 grubs per head, and six medicated animals averaged only eight per head. The difference of 28 grubs per head is statistically significant.

The results point to the probability that phenothiazine made available for prophylactic free-choice ingestion to control nematode parasites might prove of value also in controlling cattle grubs. The data here presented are only indicative and not conclusive. Many additional observations in different parts of the country will have to be made before the regimen of free-choice ingestion of phenothiazine can be evaluated as a grub control measure.

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▼ ▼ ▼

The Role Of Cultures In Immediate And Delayed Examinations Of Preputial Samples For *Trichomonas Foetus*

PAUL R. FITZGERALD,* M.S., DATUS M. HAMMOND,** Ph.D., and J. LeGRANDE SHUPE,*** D.V.M., Logan, Utah

EARLIER work with culture methods[1,2,3] for the diagnosis of trichomonad infections in cattle indicated that these methods with direct examination of vaginal and preputial samples failed to improve accuracy of diagnosis. However, following the use of antibiotics to control bacterial growth in cultures, several investigators[4,5,6] have reported a distinct increase in accuracy of diagnosis by the use of various cultural procedures. The work here described was done to determine the value of a particular culture method in examination of preputial samples for *T. foetus*. Since diagnosis frequently involves delays in examination of samples, as in shipment of samples to the laboratory, another purpose of the work here reported was to evaluate the importance of such delays in diagnosis by direct examination of preputial samples and by culture methods.

Fig. 1. Equipment used in collection of preputial samples by the douche method, including physiological saline solution, 500 cc. beaker, and syringe with 8 oz. rubber bulb.

Methods

Two different procedures were used. In the first, 152 preputial samples were collected by a douche method previously described[7] from three infected bulls over a period of about nine months. Each sample was examined within an hour of collection. This examination included centrifuging the sample and examination of a portion of the sediment. The remaining sediment, usually about 1 cc., was used as an inoculum for culture. In the second procedure 120 preputial samples were collected by the douche method from six infected bulls over a period of about six months. Each sample was divided into two approximately equal portions. One portion was centrifuged immediately, examined, and cultured, while the other was stored in a covered beaker at room temperature, or at 39 F. for 12, 24, or 48 hours, respectively, prior to examination and inoculation of cultures. The trials involving room temperature were run prior to early July, thus avoiding higher temperatures of midsummer.

The culture medium used was similar to that referred to by Plastridge,[8] except that Difco beef extract was substituted for the beef infusion, and 1 gm. of sodium chloride was added per liter of media. The formula for the medium is as follows: 3 gm. Difco beef extract; 1 liter distilled water; 10 gm. dextrose; 10 gm. bactopeptone, 0.7 gm. agar; 1 gm. sodium chloride, and 20 cc. inactivated beef serum. All ingredients, except the beef serum, were added to a three-liter flask and brought to a boil to dissolve. Then, after cooling, the pH was determined and adjusted to approximately 7.4 with dilute sodium hydroxide. The mouth of the flask was covered with heavy paper and the medium was autoclaved at 15

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lb. pressure for 30 minutes. The beef serum, collected aseptically and inactivated in a water bath for 30 minutes at 56 C., was added carefully to the autoclaved, cooled medium and thoroughly mixed with it by agitation. The medium was then dispensed aseptically in 10 cc. amounts into 15 cc. screw-capped glass vials. These vials were tested for contamination by incubation for 48 hours. Sterile vials were stored at 39 F. Just prior to inoculation, 500-1000 units of penicillin and 0.5-1 mg. of streptomycin were added per cc. of medium, and the fluid thoroughly mixed.

The inoculum was pipetted on top of the medium in the vial in such a way as to minimize mixture. It was found that trichomonads migrated to the bottom of the vial, yeasts and molds tended to remain near the top, and bacterial growth tended to be concentrated about ½ inch below the yeasts and molds. Inoculated vials were placed in an incubator at 39 C. for three to five days, after which they were examined. This was done by removing a sample from the bottom of the tube with a glass pipette or surgical needle and examining for trichomonads under the microscope.

Results

In the first part of the study, 110 of 152 samples from three infected bulls were positive by direct examination, whereas 123 were positive by culture. Only two samples that were positive by direct examination were negative by culture, while 15 that were positive by culture were negative by direct examination.

The results of the second part of the study, involving delay in examination of the samples, are shown in table 1. Of the 120 portions examined immediately, 110 were positive by direct examination and 114 were positive by culture. Three samples were positive by direct examination and negative by culture, whereas seven were positive by culture and negative by direct examination. Combining these results with those of the first part of the study makes a total of 272 samples, of which 242 or 88.9% were positive. Five of these, or 1.8%, were positive by direct examination only and 22, or 8.1%, were positive by culture only. Therefore, use of the culture method considerably increased the accuracy of diagnosis in this series of samples.

Of the 18 samples stored for 12 hours at 39 F. all were positive by both direct and culture examination, but one sample was negative by immediate direct examination. Of the 20 samples stored for 24 hours at 39 F., eight were positive by direct examination and all were positive by culture as compared with all positive by both methods for the portions examined immediately. In the 20 samples stored for 48 hours at 39 F. two were positive by direct examination and 17 by culture while in the portions examined immediately 19 were positive by direct examination and 18 by culture. In the 21 samples stored for 12 hours at room temperature, 12 were positive by direct examination and 19 by culture as compared with 20 by direct examination and 19 by culture in the portions examined immediately. In the 21 samples stored for 24 hours at room temperature two were positive by direct examination and 12 by culture while 14 were positive by direct examination and 19 by culture in the samples examined immediately. In the 20 samples stored for 48 hours at room temperature none was positive by direct examination and five were positive by culture as compared with all positive by both direct examination and culture method in the portions examined immediately.

Of 58 portions stored at 39 F. 28 were positive by direct examination and 55 by

TABLE 1. Results of examination of preputial samples for Trichomonas foetus immediately after collection or after storage at room temperature or 39 F.

Storage in hrs.	Storage temp. F.	No. of samples	Samples pos. dir. exam.	Samples pos. dir. exam. only	Samples pos. by culture	Samples pos. by cult. only
0		21	20	2	19	1
12	Room	21	12	0	19	7
0		18	17	0	18	1
12	39	18	18	0	18	0
0		21	14	0	19	5
24	Room	21	2	0	12	10
0		20	20	0	20	0
24	39	20	8	0	20	12
0		20	20	0	20	0
48	Room	20	0	0	5	5
0		20	19	1	18	0
48	39	20	2	0	17	15

culture, while of 62 samples stored at room temperature 14 were positive by direct examination and 36 by culture. Of 120 portions examined after a delay 42 were positive by direct examination, while 91 were positive by culture.

As shown in table 1 and figure 4, the culture method is considerably more reliable than the direct examination in samples kept at room temperature for 12 to 48 hours prior to examination, and in samples kept under refrigeration from 24 to 48 hours prior to examination. Samples kept from 24 to 48 hours prior to examination deteriorated markedly less when stored at 39 F. than at room temperature. Samples stored at 39 F. for 24 hours showed no decrease in number of portions found positive by culture and only a slight decrease when the samples were stored for 48 hours prior to examination.

Discussion

The results obtained in this study agree in general with those of other workers, who have used culture methods different from that used in this study. Schneider[8], using a serum-bouillon medium to which penicillin was added and a douche method of collecting samples, found 19 infected bulls of 47 examined, 11 of the 19 being negative by direct examination. Hess[6] claimed a marked superiority of a culture method involving serum-bouillon, with penicillin and streptomycin, over the direct examination method. He collected samples by a douche method and placed a layer of paraffin oil over the medium in the culture tubes. Abelein and Günzler[3] reported favorable results with a commercially prepared medium (Aktivon-Nahrboden) containing antibiotics. Seventy-four of 108 bulls (68.5%) were diagnosed as positive by both direct examination and by culture, 27 (25%) by culture only and seven (6.4%) by direct examination only. Steger and Bergemann[9] reported that 12 of 25 bulls were diagnosed as positive by direct microscopic examination of preputial samples, while four additional positive bulls in this group were diagnosed by culture method only. Weikl, Schwarz and Mundt[10] found that in 413 infected bulls 400 were positive by direct examination of preputial samples and 13 (3.2 %) were found to be positive by the culture method only.

In the study here reported the proportion of samples diagnosed as positive by the culture method only was intermediate between that found by Abelein and Günzler, Schneider, and Stegar and Bergemann on the one hand and that found by Weikl and co-workers on the other. This lack of agreement among different investigators may be a result of differences in the culture method or in methods of collecting samples, differences in the level of infection of the bulls involved, or other factors. The above mentioned studies and the finding in the present study that 8.1% of samples were diagnosed as positive when the direct examination was negative indicates that a culture method is of value in the diagnostic procedure.

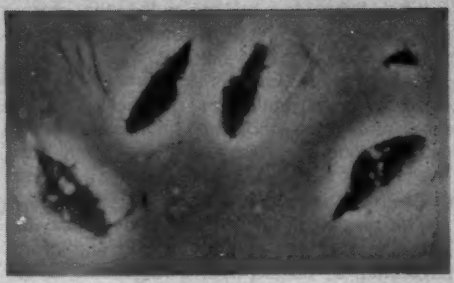

Fig. 2. Specimens of Trichomonas foetus from cultures, photographed with the aid of the phase contrast microscope (90 x objective and 10 x ocular).

Fig. 3. Trichomonas foetus. Average length approximately 15 microns. Note flagella.

The findings, with respect to delays in examination of preputial samples, correspond to some extent with those of Schneider[4]. He found that a delay of up to 12 hours prior to inoculation of cultures caused no appreciable difference in the outcome. He also divided the preputial samples from each of six infected bulls into halves and from one half inoculated cultures immediately, while from the other half cultures were not inoculated until a delay of 23-32 hours at room temperature. Those inoculated immediately were all positive; in those inoculated after the delay only four of six were positive. This compares with 12 of 21 samples positive by culture method after a delay of 24 hours at room temperature in the present study. From these

results, Schneider recommended the storing of samples under refrigeration whenever delay in inoculations of cultures was necessary. In Abelein and Günzler's[6] investigation, cultures were inoculated in the field and the tubes sent to the laboratory for incubation and examination. They were able to obtain positive results after delays of up to 72 hours prior to incubation.

The results of the present study reveal the importance of the culture method and of refrigeration in diagnosis involving delay in examination of preputial samples. After 12 hours at room temperature or 24 hours under refrigeration there was a marked decrease in proportion of samples positive by direct examination, but under the same conditions there was no decrease in accuracy of the examination by the culture method. These findings should have practical importance in working out procedures involving the collection and transport of samples from the field to the diagnostic laboratory.

Summary

In 152 preputial samples collected at different times by the douche method from three infected bulls, 110 were positive by direct microscopic examination and 123 were positive by a culture method involving a beef-extract medium. Fifteen samples were positive by culture only and two by direct examination only.

One hundred twenty preputial samples collected by the douche method from six infected bulls were divided into approximately equal portions and one portion of each sample was given an immediate direct examination and an examination by culture. Of these, 110 were positive by direct examination and 114 by culture. Seven samples were positive by culture only and three by direct examination only.

The total for the series was 272 of which 88.9% were positive, with 8.1% positive by culture only and 1.8% by direct examination only.

The 120 portions of samples not examined immediately were stored at 39 F. or at room temperature for 12, 24, or 48 hours prior to direct examination and inoculation of cultures. It was found that after 12 hours at room temperature or 24 hours under refrigeration, there was a marked decrease in proportion of samples positive by direct examination, but under the same conditions there was no decrease in accuracy of the examination by the culture method. Samples stored for 24 to 48 hours at room temperatures showed a progressive decrease in proportion of positive samples by the culture method, but samples stored for 48 hours at 39 F. showed only a slight decrease in proportion of positive samples.

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(*Continued on page 454*)

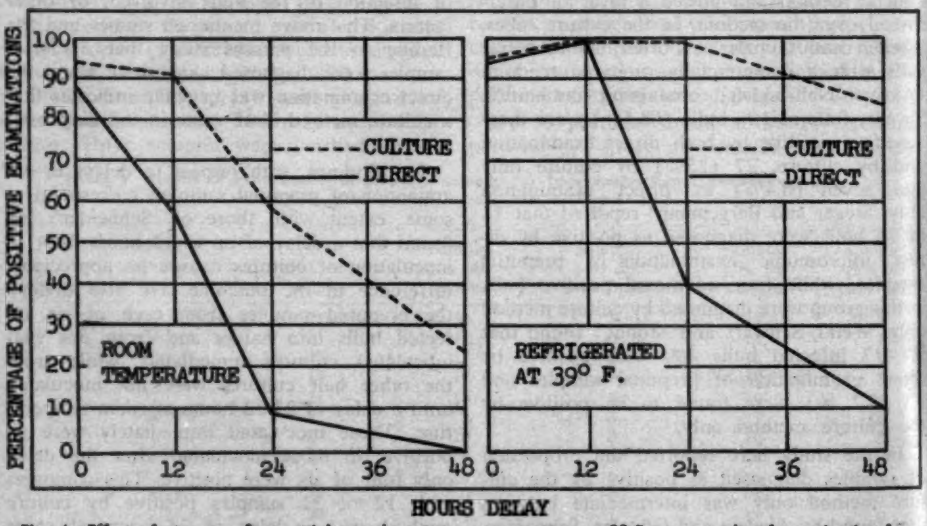

Fig. 4. Effect of storage of preputial samples at room temperature or 39 F. upon results of examination for Trichomonas foetus by the direct and culture methods.

Critical Tests With Cadmium Anthranilate As An Ascaricide In Swine

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ASCARIASIS in swine is a serious disease which is responsible for considerable loss to the hog raiser. Many pigs are killed or stunted and many livers condemned at slaughter each year as a result of this disease. Prevention of infection of young pigs with this parasite is the optimum method of combating the disease, and is practiced, to a certain extent, by all progressive growers. However, a great majority of the pigs farrowed become infected with ascarids as a result of being confined in old lots or areas which have become heavily contaminated with ova.

Treatment of infected pigs with an anthelmintic for the purpose of removing mature *Ascaris lumbricoides* from the intestinal tract has become a common and widespread practice. Oil of chenopodium, phenothiazine, and sodium fluoride have been recommended and used for this purpose. Haberman, Enzie and Foster[1] have reviewed the literature on this subject. At the present time sodium fluoride is probably the most widely used anthelmintic for swine. This chemical is apparently efficacious but toxic reactions have followed its use, and it is not palatable to swine when mixed in the feed.

The present report is concerned with the anthelmintic activity of cadmium anthranilate administered in the feed over a period of 72 to 96 hours. The ascaricidal action of cadmium was discovered during a screen testing program in which more than a hundred unrelated compounds were examined by Hall's critical method for evaluating the efficacy of anthelmintics. The author gratefully acknowledges the technical assistance of Clair Eshelman and Grethel Feiber in carrying out these investigations.

Materials and Methods

The majority of the shoats used in these tests were either purebred Hampshires or cross-bred Hampshire-Yorkshire raised on a contaminated plot at our experimental farm. A few pigs were purchased from farmers in the vicinity. Each animal was confined in a separate, concrete-floored pen for the duration of the test. Prior to treatment, feces of each animal were examined by the salt flotation method to determine that they harbored *A. lumbricoides*. The drug was thoroughly mixed into the feed and given to the pigs without a prior fast period. Feces were collected daily and screened for ascarids. When the pig ceased to eliminate parasites it was submitted to necropsy and the entire intestinal tract examined for presence of ascarids. All vital organs also were examined macroscopically for pathological lesions.

Data

Preliminary studies revealed that several different cadmium compounds possessed a variable degree of ascaricidal activity. Some of the inorganic compounds caused a temporary diarrhea with some impairment of appetite at the levels used. In view of this, attention was directed to organic cadmium compounds, several of which were found to be effective. Of all the organic compounds investigated, cadmium anthranilate appeared to fulfill the requirements of safety, efficacy, and economic feasibility. Cadmium anthranilate is a stable, white, free-flowing powder or crystals. At a pH of 5 it is soluble to the extent of 0.04 gm. per 100 ml. of water at a temperature of 25 C.

The cadmium is tightly bound in this type of molecular structure, since there is a covalent type of bonding. Such a chemical is called a chelated compound. Soluble cadmium compounds are toxic when ingested, causing gastritis, diarrhea, and prostration. Therefore, low ionization is important from the standpoint of lowered toxicity to the animal, as the few cadmium ions are less likely to form a freely soluble and absorbable cadmium compound in the gastrointestinal tract.

Preliminary observations on the efficacy of

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[1]Haberman, R. T., Enzie, F. D., Foster, A. O., Tests with Fluorides, Especially Sodium Fluoride, as Anthelmintics for Swine. *Am. Jour. Vet. Res.* 6: 131, 1945.

various doses of cadmium anthranilate for the removal of *A. lumbricoides* from 27 pigs is reported in table 1. A 0.5 gm. dose of the drug removed only seven of 20 worms from a 13-lb. pig. A 1 gm. dose removed 42 of 59 worms from four pigs for an efficacy of 71%. A 1.5 gm. dose removed 17 of 18 worms from four pigs with an indicated efficacy of 94%. Seven pigs were given 2 gm. doses of the drug

TABLE 1. Preliminary Observations On The Efficacy of Various Doses of Cadmium Anthranilate For the Removal of Ascaris lumbricoides From Swine

Pig no.	Dosage (Gm.)	Weight of Pig at treatment (lb.)	Pig at necropsy (lb.)	Worms eliminated after treatment (no.)	Worms present at necropsy (no.)	Efficacy of treatment (%)
88	0.5	13.0	18.5	7	20	25.9
95	1.0	13.0	22.0	1	0	100
99	1.0	17.5	21.5	39	3	92.8
111	1.0	58.0	78.5	0	4	0
103	1.0	61.5	84.0	2	10	16.0
90	1.5	19.5	23.0	2	0	100
51	1.5	32.5	46.0	12	1	92.3
24	1.5	45.5	59.0	2	0	100
70	1.5	54.5	84.5	1	0	100
91	2.0	18.5	22.5	15	0	100
93	2.0	21.0	32.0	11	0	100
78	2.0	33.0	47.0	4	0	100
73	2.0	34.0	50.0	3	0	100
82	2.0	98.5	130.0	5	5	50.0
89	2.0	105.0	136.0	6	6	50.0
94	2.0	127.0	165.0	0	5	0
116	2.5	21.0	24.5	75	0	100
100	2.5	41.0	56.0	1	0	100
40	2.5	75.0	107.5	4	0	100
109	2.5	96.0	126.0	8	2	80.0
84	2.5	109.5	140.0	6	1	85.7
113	2.5	123.0	153.0	1	4	20.0
105	2.5	132.0	169.5	0	4	0
98	3.0	23.5	27.0	7	0	100
9	3.0	40.0	54.0	11	0	100
17	3.0	51.0	66.0	5	0	100
96	3.5	24.0	27.5	31	0	100

NOTE: Each pig received the amount of cadmium anthranilate indicated below in 10 lb. of feed. No more feed was given until all the medicated ration was consumed. All animals were necropsied 14 days following the first day of treatment.

and 44 of 60 worms were eliminated following treatment, for an efficacy of 73%. Another group of seven animals received a 2.5 gm. dose and passed 95 of a total of 106 worms following treatment. This dosage was approximately 90% effective. All of 23 worms were eliminated by 3 gm. doses from three pigs. A 3.5 gm. dose also removed all worms from one animal. From these data it appears that cadmium anthranilate in doses from 1.5 gm. to 3 gm. could be expected to remove a satisfactory percentage of ascarids from pigs.

The efficacy of 0.066% cadmium anthranilate administered in the feed over a period of 3 and 4 days for the removal of *A. lumbricodes* from 26 pigs is reported in table 2. Twelve pigs were given the medicated ration for three days. The dosage of the drug consumed by individual pigs ranged from 1.5 to 4.5 gm. A total of 287 worms were eliminated following the three-day treatment. Five animals each harbored one worm at necropsy. No worms were present in the remaining seven animals. Treatment was 98% effective in these 12 pigs.

Fourteen pigs received the same medicated ration for a four-day period. The individual drug intake ranged from 1.1 to 5.5 gm. These pigs eliminated 244 of 263 worms following the four-day treatment for an efficacy of 92%. At necropsy no ascarids were present in eight animals; three pigs harbored one worm each and the remaining three had 3, 5, and 8 worms respectively.

Toxicity Investigations

Attempts to determine the acute, toxic dose of cadmium anthranilate were unsuccessful as the animals vomited shortly after treatment.

A 15-gm. dose suspended in a hydrolyzed corn starch solution was administered, by stomach tube, to a 91-lb. shoat. About two hours after treatment the animal vomited profusely. During the next two days appetite was impaired and there was a moderate diarrhea. On the third day appetite returned and feces were normal. Two weeks later the animal weighed 104 lb.

A Hampshire shoat, weighing 127.5 lb., was given 0.66% cadmium anthranilate (ten times the anthelmintic level) in the feed for four days. This pig consumed 18 lb. of the medicated feed containing 53.9 gm. of the drug during the treatment period. No vomiting or diarrhea occurred. Three days after treatment was discontinued the animal weighed 128.5 lb. and it was noted that the appetite was somewhat diminished. Appetite improved during the next few days and two weeks from the inception of treatment the weight was 141 lb.

In an attempt to determine the chronic toxicity of cadmium anthranilate, a 105-lb. shoat was given a ration containing 0.066% of the drug over a period of 45 days. During this time 212.5 lb. of feed containing 63.6 gm. of cadmium anthranilate was consumed. After 45 days the animal weighed 152 lb., gaining slightly over 1 lb. per day during the time it was on the medicated ration. At this time, the animal was destroyed and the following tissues were collected and preserved for patho-

logical study: Kidney, liver, spleen, pancreas, lung, duodenum, colon, and cerebrum. Examination of these tissues revealed no microscopic change of any diagnostic significance. A mild congestion of the kidney was noted and the pancreas appeared to have a slightly decreased number of islets.

The effect of administration of cadmium anthranilate and sodium fluoride on growth rate and feed efficiency of crossbred Hampshire-Yorkshire pigs over a 71-day period is reported in table 3. In this experiment, 54 pigs were divided into nine lots of six pigs each. Six lots were given cadmium anthranilate in their feed. Two lots received sodium fluoride and the remaining lot was given an unmedicated ration.

The controls (lot 9) gained 1.43 lb. per day and required 348 lb. of feed for 100 lb. of gain over the 71-day period.

Lot one was given 0.066% cadmium anthranilate in their feed continuously for 71 days during which time they consumed a total of 1,386 lb. of feed containing 415 gm. of the drug. These pigs made an average daily gain of 0.91 lb. and required 357 pounds of feed per 100 lb. of gain. One shoat from this lot was slaughtered on the 71st day and the meat divided among the workers at the laboratory. No adverse effects were reported by anyone who consumed meat from this animal.

Lot 2 was given 0.044% cadmium anthranilate in their ration and consumed 1,646 lb. of medicated feed containing 339 gm. of the drug. This lot gained 1.08 lb. per day and required 357 lb. of feed per 100 lb. of gain.

In order to ascertain the effect of further administration of cadmium anthranilate to the above lots, the medicated rations were continued another four weeks. Thus, these hogs

TABLE 2. Efficacy of 0.066% Cadmium Anthranilate in the Feed Over a Period of 3 to 4 Days for the Removal of Ascaris lumbricoides from Swine

Pig No.	Duration of treatment (Days)	Total drug consumed (Gm.)	Weight of pig at treatment (lb.)	Weight of pig at necropsy (lb.)	Worms eliminated after treatment (no.)	Worms present at necropsy (no.)	Efficay of treatment (%)
27	3	1.5	35.0	43.0	5	0	100
32	3	2.8	42.0	53.5	30	1	96.0
37	3	2.6	43.5	62.0	22	1	95.6
35	3	2.8	46.0	57.0	29	0	100
10	3	3.9	77.0	96.0	40	1	97.5
43	3	3.7	81.5	99.0	20	1	95.2
56	3	3.8	82.5	101.0	80	1	98.7
18	3	3.8	85.5	102.0	3	0	100
15	3	4.3	88.5	111.0	1	0	100
5	3	3.9	100.0	123.0	24	0	100
4	3	4.5	109.0	130.0	15	0	100
52	3	4.6	111.5	139.0	18	0	100
34*	4	1.1	15.5		37	3	92.5
3	4	2.1	45.5	94.5	2	5	28.5
12	4	3.0	50.5	98.0	3	0	100
1	4	3.0	51.0	96.0	11	1	91.6
27	4	1.9	54.0	60.0	43	0	100
18	4	3.0	54.5	63.0	7	0	100
6	4	3.4	55.0	70.5	9	0	100
19	4	3.6	55.0	66.0	14	8	63.6
21	4	4.2	64.0	69.0	28	0	100
25	4	5.5	84.0	105.0	21	0	100
37	4	4.8	84.0	101.5	10	0	100
16	4	4.3	89.0	104.0	15	1	93.7
34	4	5.1	98.5	117.0	3	1	75.0
14	4	5.5	98.5	119.0	41	0	100

*Due to an oversight this animal was not weighed at the time of necropsy.

NOTE: All animals were necropsied 14 days following the first day of treatment.

received the drug continuously for 98 days. At the end of this time the average weight of the hogs in lot 1 was 159.2 lb. and lot 2 averaged 175.4 lb. Three weeks after the medicated rations were discontinued, lot 1 had reached an average weight of 190.6 lb. and lot 2 weighed 207.5 lb. It is apparent, therefore, that these hogs suffered no permanent ill effects from consumption of cadmium anthranilate over the 98 day period.

Lots 3, 4 and 5 were given 0.044, 0.088 and 0.132% cadmium anthranilate for 3, 1, and 2 days respectively. These three lots made a satisfactory daily gain but required slightly more feed per 100 lb. of gain than did the controls.

Lot 6 was given 0.066% cadmium anthranilate for three days and consumed 60 lb. of the medicated feed. The average daily gain for this lot was 1.57 lb. and 349 lb. of feed produced 100 lb. of gain.

Lots 7 and 8 were given 0.5 and 1% sodium fluoride for two and one day respectively. Lot 8 consumed only 9 lb. of the medicated feed which seems to validate the observation of many hog raisers that 1% sodium fluoride is not palatable to swine. Consumption of the 0.5% sodium fluoride ration was also less than any of the cadmium anthranilate rations. The lot which received the 0.5% sodium fluoride for two days gained approximately the same as the control lot, but required 25 lb. more feed per 100 lb. of gain. The 1% sodium fluoride lot consumed considerably less of the drug and their gain was greater than the control lot, but 11 lb. more feed was required for a 100 lb. gain.

It is a well known fact that cadmium has been responsible for causing toxic symptoms in man. Most such cases have come about after ingestion of acid fruit drinks prepared in cadmium plated or galvanized containers, or from inhalation of cadmium as a result of certain industrial processes. Ingestion of soluble or ionizable cadmium compounds is followed by severe nausea, vomiting and diarrhea. Since pork is an important item in the diet of man it is obviously important to ascertain whether tissues from cadmium treated swine are safe for human consumption. Accordingly the edible tissues from ten hogs treated with cadmium anthranilate were analyzed for cadmium by the spectrophotometric dithizone method†. The metal was present in minute quantities in the kidney and liver and in a few cases it also was present in the lungs and spleen. However, 30 days after treatment amounts were so small as to be insignificant. In order to avoid any possibility of human intoxication from eating pork from cadmium anthranilate treated hogs, it is not considered advisable to permit slaughter within 30 days following treatment. Cadmium never was determined to be present in muscle tissue, which is important since this is the major edible part of the carcass.

In one animal which received 0.066% cadmium anthranilate in the feed continuously for 45 days, cadmium was present in decreasing amounts in the following tissues: Kidney, liver, spleen, duodenum, lung and brain. No cadmium was found in the muscles or heart. The kidneys, liver, spleen, heart and a ham from this hog were cooked in an autoclave at 15-lb. pressure for 20 minutes and then fed to a dog over a seven-day period. No supplemental feed was given during this time. At no time did this animal show any symptoms of cadmium intoxication. There was no vomiting and the feces were normal but scant, which is to be expected since the diet contained very little fiber. The dog gained 3.5 lb. during the seven-day period and there was a normal gain in weight during three weeks after feeding these tissues.

To ascertain the effect of ingestion of cadmium-containing meat, the kidneys, livers, and lungs from 15 cadmium-treated pigs were fed to 14 white rats continuously for five weeks. These tissues were collected at necropsy and cooked at 15 lb. pressure for 20 minutes and then frozen. Twelve male and two pregnant female rats were included in the experiment. Two rats were given kidney tissue only for three weeks, and were then put on a mixture of lung, liver and kidney. Each animal was weighed at weekly intervals. Both pregnant females delivered living litters during the first week of the experiment. No nest material was provided until the young were born and both of the females became nervous and ate their litters shortly after birth.

During the five-week experimental period these rats received no feed except the cooked tissue as indicated above. Each animal consumed more than 1400 gm. of cadmium-containing meat during this time. With the exception of the two pregnant females, they all had gained weight at the conclusion of the experiment five weeks later.

In order to determine the effect of treatment on pregnant sows, three first litter crossbred Yorkshire-Hampshire gilts were given 0.066% cadmium anthranilate in a complete ration for three days, during which time they

†These analyses were made by Sadtler Research Laboratories, Philadelphia, Pa.

consumed 81 lb. of the medicated feed. Four days following cessation of treatment one gilt farrowed ten living pigs. She subsequently laid on two of these. The remaining eight pigs were normal two weeks after birth. Another gilt farrowed ten living pigs seven days after treatment and all pigs were living two weeks later. The third gilt farrowed nine living pigs nine days following treatment. Three pigs crawled away, became chilled during the night, and subsequently died. The remaining six pigs were normal two weeks later.

Toxicity for Animals Other than Swine

Eight female goats nursing kids consumed 950 lb. of a 16% hog ration containing 0.066% cadmium anthranilate over a 32-day period. There was no evidence of physiological disturbance in the does or their kids during the time they had access to this feed.

An 80-lb. goat was given 15 gm. of cadmium anthranilate *per os*. There was a diarrhea and inappetance for four days following treatment, but the animal had gained its original weight 22 days later.

A 25-gm. dose caused diarrhea and inappetance in an 89-lb. goat for 12 days after treatment. Impairment of the appetite continued for several days but eventual recovery ensued.

A 30-gm. dose of cadmium anthranilate was fatal to a 93-lb goat. There was a severe diarrhea, inappetance, and dilatation of the pupil in both eyes prior to death.

A 445-lb. Holstein heifer was given 0.066% cadmium anthranilate in a 12% protein ration. This heifer consumed approximately 6 lb. daily of the medicated ration over a 30-day period. During this time appetite remained normal and there was no diarrhea. At the conclusion of the feeding period the heifer weighed 510 lb.

A 44-lb. Collie dog was given a commercial dog food containing 0.066% cadmium anthranilate for two weeks. During this time the dog consumed 14 lb. of the medicated feed. No symptoms of intoxication appeared in this dog during the time the drug was included in the feed.

Twenty-four White Leghorn cockerels were confined in a battery and given a broiler ration containing 0.066% cadmium anthranilate for one week. A total of 50 lb. of the medicated feed was consumed during this time. There was some retardation in the growth rate but no other evidence of intoxication was manifested.

Discussion

Cadmium anthranilate was administered to 53 infected pigs in six critical tests and found to exhibit a marked ascaricidal activity. The drug was well tolerated and readily acceptable to hogs when mixed with the feed. Several other cadmium compounds were found to be effective but it is believed that cadmium anthranilate more nearly fulfills the requirements of safety, efficacy, and economic feasability. The molecular structure of this compound is such that the cadmium is more tightly bound, thus making it less available for the formation of more soluble cadmium compounds, such as cadmium chloride, after administration to the animal.

Critical tests indicate that the drug may be administered in the feed at a concentration of 0.066% for a period of three to four days with a high degree of efficacy against *A. lumbricoides*. The efficacy of the drug was not impaired when the treatment period was re-

TABLE 3. Growth Rate and Feed Efficiency of Swine Receiving Cadmium Anthranilate or Sodium Fluoride in Their Rations Over Variable Periods of Time.

Lot no.	Number of pigs	Treatment	Amount of medicated feed (lb.)	Number days on medicated feed	Initial mean weight (lb.)	Mean weight 71 days (lb.)	Mean daily gain 71 days (lb.)	Feed per 100 lb. gain
1	6	0.066% Cadmium anthranilate	1386	71	66.3	131.0	0.91	357
2	6	0.044% Cadmium anthranilate	1646	71	67.0	143.5	1.08	357
3	6	0.044% Cadmium anthranilate	60	3	66.5	170.83	1.47	366
4	6	0.088% Cadmium anthranilate	30	1	66.75	172.5	1.49	357
5	6	0.132% Cadmium anthranilate	30	2	67.5	178.0	1.55	354
6	6	0.066% Cadmium anthranilate	60	3	67.9	179.5	1.57	349
7	6	0.5% Sodium fluoride	25.5	2	66.58	167.83	1.42	373
8	6	1.0% Sodium fluoride	9	1	67.3	174.83	1.51	359
9	6	Controls	.....	.....	65.58	167.66	1.43	348

duced to three days. No evidence of intoxication was observed following administration of cadmium anthranilate to swine. In fact, one group of pigs which were scouring and coughing, and otherwise appeared to be poor physical risks at the time of treatment, were noticeably improved after receiving the drug. Nothing is known of the activity of this agent against other roundworm parasites of swine.

Toxicity studies indicate that there is little danger to hogs from administration of the drug at therapeutic levels well beyond the recommended three-day treatment period. Eleven animals were maintained on 0.066% of the drug in the ration for 14 weeks, during which time there was no evidence of intoxication other than a reduced feed intake and rate of gain when compared with the unmedicated control lot. After the medicated ration was discontinued all of the animals fed out normally. Microscopic examination of the liver, kidney, lung, duodenum, colon, cerebrum, and pancreas of one animal, which received 0.066% cadmium anthranilate in the feed for 45 days, revealed no pathological lesions.

It was impossible to determine the acute toxicity of cadmium anthranilate when given *per os* as the animals promptly vomited after administration of large doses. One shoat was given ten times the therapeutic level in the feed for four days. There was no vomiting or diarrhea during the treatment period, and the animal had gained 13.5 lb. two weeks following treatment.

Liver, kidney, and lung tissue from cadmium-treated swine was fed to a dog for one week and to 14 white rats for five weeks, with no evidence of intoxication. In addition a 132-lb. shoat which had received 0.066% cadmium anthranilate in the ration continuously for 71 days was slaughtered, and the edible parts of the carcass were consumed by the laboratory staff and their families. No adverse effects were experienced by anyone consuming the meat from this animal.

Analysis of the various edible tissues of treated hogs indicates that cadmium is retained in minute quantities in the kidneys and liver and to a variable degree in the lungs and spleen. The metal never was found to be present in muscle tissue even after continuous administration of the therapeutic level for 45 days. Thirty days following treatment cadmium was present only in insignificant quantities in kidney and liver tissue. To preclude any chance of human intoxication from eating meat from treated hogs it is recommended that cadmium anthranilate not be administered to animals which will go to slaughter within 30 days.

Limited observations indicate that cadmium anthranilate may be given to pregnant sows with safety. Three first-litter gilts were treated four to nine days prior to farrowing with no evidence of intoxication or effect on the livability of the pigs.

The therapeutic level of cadmium anthranilate has been given in the feed to eight female goats nursing kids, a heifer, a rabbit, a dog, and to 24 chickens with no evidence of intoxication. It appears, therefore, that feeds containing the drug may be used safely around the farm.

Summary

In six critical tests involving 53 parasitized hogs, cadmium anthranilate was found to exhibit a marked ascaricidal activity. The observations herein reported indicate that the drug should be given in the ration at a concentration of 0.066% for three consecutive days for the most consistent results. In 12 pigs so treated, 287 of a total of 292 ascarids were eliminated for an efficacy of 98%. Fourteen pigs which received the same concentration of the drug for four days eliminated 244 of 263 ascarids for an efficacy of 92%,

Studies on the toxicity of the drug indicate that there is a wide margin of safety. One shoat was given 0.66%, ten times the anthelmintic level of the drug in the feed for four consecutive days, with no untoward effects. The anthelmintic level (0.066%) was fed to 11 hogs continuously for 14 weeks, with no effect other than reduced weight gains and feed consumption. When the medicated feed was discontinued, the animals showed no further evidence of growth retardation.

Cadmium was retained in minute quantities in the kidney and liver, and in some cases in the lungs and spleen, of treated swine. There was a gradual elimination of the metal from these tissues and 30 days following treatment the amount was insignificant. At no time was cadmium found in muscle tissue even after administration of anthelmintic levels of the drug for 45 days.

Feeding cadmium-containing tissues collected from treated pigs at necropsy two weeks after treatment caused no evidence of physiological disturbance in a dog and 14 white rats.

No adverse effects were experienced by anyone of several persons who consumed pork from a shoat which had received 0.066% cadmium anthranilate in the feed continuously for 71 days.

Bovine Mastitis: I. Pathogenicity Testing Of Micrococci (Staphylococci)

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IT has been one of the functions of this laboratory for the past several years to examine milk samples for the diagnosis of mastitis. The program has been voluntary, and samples could be sent to the laboratory by either farmers or veterinarians. Most of the samples came from herds experiencing mastitis problems.

The work of Plastridge *et al.*[8] in 1939 established the importance of micrococci in mastitis. There is considerable controversy in the literature relative to the most satisfactory test for determining the pathogenicity of *Micrococcus pyogenes* (Staphylococcus). Dubos[1] regards the coagulase test, using rabbit plasma, as the most reliable single *in vitro* criterion for the identification of pathogenic staphylococci. Blair,[2] in 1939, in a review of the pathogenic staphylococci, stated that in his own experience with *in vitro* tests, the coagulase reaction alone was a sufficient indicator of the pathogenic potentiality of staphylococci.

Materials and Methods

The milk samples covered by this survey were sent in from August 1950 until July 1, 1953 and were obtained by veterinarians or farmers from individual quarters after thoroughly cleaning the end of the teat with an alcohol swab. Sterile tubes containing one drop of 1.1% aqueous solution of sodium azide were furnished by this laboratory to collect the samples. Upon receipt at the laboratory, samples were placed in 37.5 C. incubator. The following day a thin smear was made from each (1 cm. sq.) and stained with Erb's* stain. The stained smears were examined microscopically and the leucocyte count, as well as the types of bacteria (chains, rods, cocci, *etc.*), were recorded. Those samples with a million or more polymorphonuclear leucocytes per cubic centimeter were cultured. The milk was cultured on Difco blood agar base containing 5% blood. Virgin heifers served as the only source of blood for making media. The milk also was cultured on modified Edward's media for streptococcus isolation. After 24 hours incubation, blood plates were observed. *Beta* hemolytic *Micrococcus pyogenes* var. colonies were smeared and Gram-stained for confirmation. The pigment color of the colonies was noted. The tube coagulase test was performed on all samples producing *beta* hemolytic colonies. A loopful of the suspicious organism was scraped from the culture plate and mixed with 0.5 ml. of a 3:1 dilution of saline and rabbit plasma. The rabbit plasma was stored in the refrigerator for a period not longer than ten days. Experimental trials indicated that frozen plasma was of no value. The mixed sample was placed in a 37.5 C. water bath and observed at hourly intervals for the first seven hours, again in 15 hours and hourly until the 24-hour period was reached. Positive samples coagulated so completely they would not run out of the tube. Known positive and negative controls were set up with every test.

Results and Discussion

The coagulase test results in 1,288 cultures over a three-year period are shown in table 1.

It was found that on blood agar most *beta* hemolytic colonies were white and typed as *Micrococcus albus* var. In fact, few orange colonies were observed.

Forty three per cent of the total number of cultures were coagulase positive in six hours; the remainder required up to 24 hours to become positive. The plate test, which is necessarily read within a few minutes, might not show positive on these samples with delayed reactions.

It also should be noted that from the year 1950 to 1953 the number of coagulase positive cultures increased from 57.8% to 73.9%. The continual use of antibiotics, particularly at

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*Erb's Stain: Methylene blue 1.0 gm.; Ether 100 ml.; Methyl alcohol 100 ml. Dry film in air. Fix with heat. Dip in stain. Wash gently in water. Dry in air.

TABLE 1. Coagulase Testing of Milk Micrococci

Staphylococcus		Hemolysis			Coagulase (Positive) time in hours												Total Pos.	Neg.
Albus	Aureus	Alpha	Beta	Gamma	2	3	4	5	6	8	10	12	16	20	23	24		
1950-51																		
291	8	13	283		17	23	26	12	4	8	4	8	11	—	3	57	173	126
1951-52																		
442	10	4	448		119	2	47	—	13	8	—	50	—	6	3	31	57.8%	173
1952-53																		
535	2	2	535		151	—	129	—	11	—	—	36	12	2	—	56	397	140
																	73.9%	
1268	20	19	1266	3	287	25	202	12	28	16	4	94	23	8	6	144		439

low levels, might have caused this increase of coagulase positive cultures.

Table 2 shows that the total number of isolations of *beta* hemolytic var. *albus* has not increased, but has decreased slightly, in a three-year period.

TABLE 2. Percentage of M. var. albus Isolations

Year		Total No. Cultures	*M.* var. *albus* %
1950-51	71 herds	660	44
1951-52	100 herds	1,008	43.8
1952-53	114 herds	1,256	42.5
Total	285 herds	2,924	

Regardless of the constant percentage of var. *albus* cultures the percentage of coagulase positive cultures has increased appreciably.

The results of 20 cultures are shown in table 3.

TABLE 3. Coagulase Test Results of M. var. aureus From Milk

No. Cultures	Time Coagulase Positive Hrs.	Negative
1	2	
1	3	
2	24	
16		16

Although a small number were tested, only 20% of orange cultures were coagulase positive.

Plastridge[2] observed that there was little correlation between the ability of udder micrococci to form pigment, and their irritating effect on the udder. The above results indicate that coagulase positive cultures from milk are most commonly of the albus variety.

Summary

1. The tube coagulase test, using rabbit plasma, was used as a laboratory indicator of pathogenicity in *M. pyogenes* cultures isolated from milk.

2. In a three-year period, 1,288 cultures were tested; 65.9% were coagulase positive.

3. There was a yearly increase in the number of coagulase positive cultures, although the total percentage of *M. pyogenes* var. *albus* was isolated more commonly in milk than was *M.* var. *aureus*.

5. Because the samples came from suspected cases of mastitis, the coagulase test of all *beta* hemolytic Micrococci colonies was used as a criterion of pathogenicity.

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Feed Supplementation for Disease Resistance

In a research project conducted at the University of Wisconsin to determine the effect of trace mineral supplementation, it was found that the combination of the minimum requirement of approximately 0.07 parts cobalt per million of total ration, and steamed bone meal gave lambs the greatest resistance to parasitic infection. The lambs were infected experimentally with larvae of *Haemonchus contortus*. The combination of steamed bone meal and cobalt gave better results than cobalt alone. It is believed that the cobalt portion of the supplement caused an increased rate of synthesis of vitamin B_{12} in the rumen. Heavily parasitized lambs have need of increased amounts of phosphorous and calcium, such as is contained in the steamed bone meal.—*R. R. Dykstra.*

Neomycin Sulfate In *Salmonella Dublin* Infection Of Calves

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SUBSEQUENT to initial isolation from milk (Hutchens, 1910), *Salmonella dublin* was recovered from human urine (Gregory, 1920), cases of calf enteritis (Jensen, 1920), cases of epidemic meningitis in children (Pesch, 1926), and from a case of fatal pyrexia following kidney operation in Dublin, Eire[2] (Bigger, 1926). It since has been described as the etiological agent in numerous infections of both man and animal[2,3].

Dublin-type Salmonella now is considered one of the primary causes of calf diarrhea[4]. It infects not only calves[3,6,7,8,9] and adult cattle, but horses,[10] foals,[4] swine,[4] fox, turkeys,[5] and canaries[5]. It has been found in the mature udder and milk-borne infections in man have accordingly been described. However, the pathogenicity of this organism is variable since its presence has been noted in healthy cattle[11].

Distribution

Sal. dublin has world-wide distribution. It has been reported in Sicily, the Rhineland, England, and South America. In the United States, its incidence is lower than in other parts of the world[2].

Within the confines of the United States, prevalence of this organism assumes a bizarre pattern. All positive cultures have been reported from the Far West; none have been accomplished east of the Rocky Mountains. *Sal. dublin* has not been found in eastern and middle-eastern fox, although it is common in western fox. In California, the organism has been isolated from cattle, turkeys, canaries, and man.

While it is a surprising fact that this infection is not at present notoriously widespread in the eastern United States, the possibility of this potential hazard extending into the region exists. Because of the extreme severity of outbreaks, particularly in cattle and man, it is imporant that livestock sanitary officials and public health officers prevent spread to eastern herds[2].

Neomycin

Neomycin has won widespread veterinary acclaim because of board-spectrum bactericidal action against both Gram-positive and Gram-negative organisms. Because it is only poorly absorbed from the intestinal tract, it is practically nontoxic when administered orally to animals[12,13,14,15].

Various clinical applications of neomycin have been described by a number of workers[16,17,18,19,20,21,22,23,24,25]. It has been observed to be effective in controlling enteric infection in large animals and its use in enteric disease of small animals has been described by Konde and Monroe,[15] Schweinburg,[22] and Brown and Schirmer[27].

Sal. dublin Outbreak In Calves

Outbreaks of *Sal. dublin* infection occurred in a large herd of approximately 1,200 milkers. The majority of the herd was Holstein, with a few Guernseys. In this herd, heifer calves are kept routinely as replacements and broken to bucket in separate starter-pens. At one week, they are placed in groups of ten for one month and fed milk from a community trough twice daily, broken to grain, offered free-choice alfalfa hay, supplemented with reconstituted milk products. At six weeks to two months of age, they are transferred to larger pens in groups of 15 to 20. It was in this older group of approximately 180 calves that the disease was confined.

Symptomatology in Individual Animals

Prior to obtaining professional attention, the herdsman treated sick calves with a variety of drugs including aureomycin,[@1] kaopectate,[@2] oral streptomycin, and injectable penicillin. This formidable regimen proved ineffective and the disease spread rapidly to other calves.

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The author wishes to acknowledge cooperation extended by Kenneth B. Haas, D.V.M., Department of Veterinary Medicine, The Upjohn Company, Kalamazoo, Michigan; William W. Worcester, D.V.M., State Pathological Laboratory, Fresno, California; Mr. Clifford R. Knight, and Mr. Ray Benlehr.

@1Lederle Laboratories Div., Pearl River, N. Y.
@2The Upjohn Company, Kalamazoo, Mich.

Two weeks after onset, the following history and symptoms were noted: The greater percentage of the herd was affected. Individual onset spanned 24 hours. A temperature of 107-8 F. was observed on the first day of illness, and 103-4 F. on the second day. Temperature remained at this elevation until recovery or death. Inappetance generally occurred on the second or third day of illness, but some continued to eat until immediately prior to death. Diarrhea began on the second day and the stools changed from a pasty, watery consistency and became fetid and whitish-yellow in color. Depression was pronounced. Few calves broke with the pneumonia complex.

Diagnosis

In this case, fecal samples were delivered to the state laboratory for bacterial indentification. *Sal. dublin* was identified and sensitivity to antibiotics determined. The organism was found resistant to penicillin, streptomycin, aureomycin, bacitracin, and chloromycetin,[@*] and susceptible only to neomycin. Whether or not antibiotic resistance was caused by the herdsman's preliminary ineffective treatments with those antibiotics is not known. Similar outbreaks in Fresno however, resulted in 100% mortality in calves, despite treatment with those anibiotics against which the organism was found resistant.

Necropsy diagnosis of two calves was typical generalized septicemia. *Sal. dublin* was recovered from all tissues.

Simultaneous presence of more common bacterial invaders renders definite diagnosis difficult from symptomatology alone. The practitioner must rely on laboratory isolation and identification of the responsible organism.

Index of suspicion of salmonellosis infection is raised when there is previous history of outbreak on the premises, new herd introductions, and unsanitary conditions.

Treatment

Treatment with neomycin tablets was instituted in 40 sick calves which survived the originally infected 50. Dosage was two tablets every 12 hr. (4—0.5 gm. mycifradin[@*] sulfate tablets) for the first three days, then one tablet a day until recovery. This minimal dosage was promptly effective in 30 calves. Three others relapsed, necessitating retreatment, resulting in a total of 33 calves which eventually recovered. Seven, in which the disease was advanced or nearly terminated prior to treatment, died despite therapy.

[@*]Parke, Davis & Co., Detroit, Mich.

Course of disease in the treated group was three to seven days, with an average of five days. The ten animals which died prior to the neomycin study had received preliminary antibiotic treatment from the herdsman and had survived three to five days. Undoubtedly, neomycin was directly responsible for the rapid disappearance of symptoms and for calf survival.

Sanitary measures included elimination of the community trough feeding method until infection was controlled. There have been no new breaks to date.

Discussion

The large number of drugs available for treatment of bovine intestinal diseases of bacterial origin is sufficient to indicate the need of a drug having specific action. Current methods often leave much to be desired. It is obvious from the results reported here that neomycin deserves further investigation as a therapeutic agent for enteric diseases of bacterial origin.

Summary

An outbreak of *Sal. dublin* infection in a group of 50 calves is reported. Neomycin sulfate tablets were administered to 40 surviving calves which had received other antibiotics without effect and from which the causative organisms were found resistant to them, but susceptible to neomycin. Seven moribund cases died; 33 recovered completely. All untreated calves died.

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(*Continued on page 452*)

A Note On Certain Blood Values Of Adult Sheep

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THE findings reported herein were recorded during the month of January 1952, in blood determinations made preliminary to a study of internal parasitism of sheep. The publication by workers of their blood studies on normal animals, whether the number of animals recorded be in small or large groups, will do much to augment the scarcity of data now available in this field.

Methods and Procedure

Twenty purebred Hampshire sheep, consisting of 15 ewes and five rams, ranging in age from 11 to 36 months were selected by random sampling from a farm flock of 50 sheep in the eastern coastal area of North Carolina.

Owing to the poor pasture available the ration was supplemented with soy bean hay and yellow corn. Of the 15 ewes, eight were non-gravid, and seven gravid. The gravid ewes were in the following periods of gestation: one 11 weeks, one 13 weeks, one 14 weeks, two 17 weeks, and two 19 weeks.

Examination of fecal material from these animals showed the entire group to be mildly infected with internal parasites, each animal being infected with two or more species of parasites. The animals appeared to be in good farm flock condition.

Blood samples were obtained from the jugular vein and subjected to the following determinations: total erythrocyte and leukocyte counts, cell differential counts, hemoglobin concentration, measurement of erythrocyte diameter, specific gravity of the whole blood, and the plasma, plasma total proteins, erythrocyte resistance (fragility), and blood coagulation time.

The hemoglobin concentrations were determined colorimetrically by means of the Spencer Hb-meter†. Hemoglobin values of 15.6 gm. per 100 ml. of blood represented 100%.

The erythrocyte diameters were measured by means of an ocular micrometer. The specific gravity determinations were obtained by employing the falling drop method of Barbour and Hamilton[1]. The instrument used for this purpose was the densiometer††.

Plasma protein content was determined with the falling drop method, employing the formula of Moore and Van Slyke[2]: P=343 (G—1.0070) in which P represents the grams of total protein per 100 ml. of plasma, and G its specific gravity, calculated as specific gravity 20 C./20 C. The above workers in a series of 118 observations found the maximum deviation of the chemically determined protein content from that estimated by the specific gravity was 0.6%. The accuracy of predictions based one the above formula has been verified by other investigators[4,7,8]. Only one drop of blood plasma is required (0.01 ml.) and each determination may be made in less than two minutes. Heparin was used as the anticoagulant.

Erythrocyte resistance was determined by placing a drop of blood in saline solutions ranging in concentration from 0.8 to 0.4% sodium chloride, readings being made at the end of two hours at room temperature. Initial hemolysis being reported in that concentration of saline solution in which hemolysis was just commencing, and complete in that concentration in which all corpuscles were hemolyzed. Blood coagulation values were determined by using the capillary tube method.

Results

The Erythrocytes. The total red cell count averaged 8.9 million per cmm., and ranged from 4.8 to 12.2 million per cmm. of blood. The average erythrocyte diameter was 4.2 microns, with a range of 3.2 to 6.5 microns.

No immature erythrocytes were observed in any of the bloods examined.

Five of the seven gravid ewes, which were in the 13 to 19 week gestation period, showed macrocytosis and hyperchromia.

Holman[3] found the total erythrocyte count in the blood of 100 sheep, three months of age or over to average 11.5 million, and range between 6.2 and 15.2 million per cmm.

The above worker with the same group of

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†Spencer Hb-meter. Made by American Optical Co., Buffalo, N. Y.

††Densiometer—large model. Made by LaMotte Chemical Products Co., Towson, Baltimore, Md.

sheep found the average red cell diameter to measure 4.7 microns, ranging from 3.5 to 6.0 microns. Holman[4] reported a drop in erythrocyte numbers in normal sheep, without change in size or shape and without the appearance of immature erythrocytes, in the spring of the year, and thought this to be due to lack of good pasture. Holman also observed the occurrence of hyperchromic and macrocytic anemia in ewes before and shortly after lambing.

Gordon *et al.*[8] found the number of erythrocytes in three purebred and halfbred Blackface sheep to average 11.1 million per cmm. of blood.

Hemoglobin. The hemoglobin values for the group averaged 12.25 gm., ranging from 8.5 to 15.5 gm. per 100 ml. of blood.

The hemoglobin content of the blood of 114 adult sheep examined by Holman[3] was found to average 12.4 gm., ranging from 8.6 to 15.8 gm. per 100 ml. (Sahli-Zeis Method).

The Leukocytes. The total leukocyte counts averaged 5,100 per cmm., ranging between 3,200 and 10,200 per cmm. of blood. In all but two of the blood smears examined the number of lymphocytes exceeded the number of neutrophiles seen.

Table I shows the average per cent and type of cells observed in the blood smears for this group, as compared with the findings of Holman[3] and Gordon *et al.*[8].

Erythrocyte resistance. Beginning hemolysis took place on the average in 0.65% saline, and was complete in 0.55% saline solution. In erythrocyte resistance studies on the blood of 98 adult sheep, Holman[3] found that complete hemolysis occurred in 0.55% saline solution, while Gordon *et al.*[8] observed that the erythrocytes of three adult sheep were completely hemolyzed with 0.556% saline solution.

Coagulation. The average blood coagulation time for the group of 20 sheep was 2.65 minutes, ranging between 2.0 and 3.5 minutes.

Holman[3] using the same method found the average coagulation time for the blood of 77 adult sheep to be 2.5 minutes. The average coagulation time for the blood of three adult sheep reported by Gordon *et al.*[8] was 2.59 minutes.

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TABLE I

No. and Age of Sheep	Leukocytes per cmm. Average	Range	Cells per 100 Leukocytes: Immature Neut.	Mature Neut.	Eos.	Baso.	Lymph	Mono.	Author
11-adult	12,604	7750-16500	....	32.4	6.9	....	53.4	....	Gordon *et al.*[8]
116-3 mo. or more	9,200	2000-28000	0.5	24.0	4.2	0.5	67.3	2.3	Holman[3]
20-adult	5,100	3200-10200	1.0	36.0	7.2	0.5	52.0	2.5	Present Study

Specific Gravity. The specific gravity of the whole blood was found to average 1.050, with a range between 1.038 and 1.065. The specific gravity of the plasma averaged 1.023, with a range from 1.014 to 1.030.

Holman[3] found the specific gravity of the whole blood of 89 sheep over three months of age to average 1.052, and to range from 1.042 to 1.065.

Gordon *et al.*[8] reported that the average specific gravity of the whole blood for three adult sheep was 1.051.

Plasma proteins. The plasma protein content was found to average 5.49 gm., ranging from 2.40 to 7.88 gm. per 100 ml. of plasma.

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Ammoniated Molasses Feeds

Ammoniated molasses, as a growing ration for cattle, received somewhat of a setback when the Kansas and the Mississippi stations reported that calves receiving from 15% to 33% protein equivalent ammoniated molasses as a part of the protein supplement became so excited that they ran through fences or any obstruction in their path. They also lost weight. When the ammoniated portion of the ration was discontinued gains increased and mental equilibrium was restored.

SMALL ANIMAL PRACTICE
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The Use Of An Intermittent Positive Pressure Device In Open Chest Surgery In Dogs*

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IT is the purpose of this paper to discuss the use of three artificial means of maintaining respiration in dogs undergoing open chest surgery, and to present the clinical value of one mechanical device that operates on the principle of intermittent, positive pressure.

With the performance of surgical procedures in and through the thorax becoming more common, increased attention is being placed on equipment necessary to maintain adequate respiration and oxygen supply. Thoracic surgery in the dog has the increased difficulty of a physiologically imperfect mediastinum. Because of this, any opening in the thoracic chamber will effect a collapse of both lungs. It is, therefore, necessary to maintain effective respiration by mechanical means in any chest surgery in the dog. This can, of course, be accomplished by a great number of means ranging from inflating the lungs by blowing through a trachael catheter to elaborate, and expensive, rebreathing machines.

Many different devices have been employed in an attempt to achieve mechanical and physiologically adequate respiration during open chest procedures. Because of the nature of our work, it was essential that the method used should provide a maximum of security and a minimum of technical care or attention. This same condition, frequently met by the veterinarian, ruled out the use of manual compression tactics, windshield wiper devices, and other similar procedures.

Diffusion Apparatus

Recently considerable concentration has been focused on two completely different principles of mechanically-induced respiration. The first of these, a diffusion type of apparatus as described by Knowles, *et al.*[1] has enjoyed most prominent use and demonstration at various meetings. Basically the diffusion apparatus employs the use of an excess flow of oxygen through an inflated cuff endotrachael tube. The constant flow of oxygen provides the alveoli with a high concentration of oxygen under positive pressure. The oxygen diffuses with the alveolar carbon dioxide so that there is a constant removal of the latter. The degree of lung inflation is achieved by means of a calibrated manometer immersed in a jar of water. The deeper the manometer is immersed in the water, the greater the intrapulmonary pressure and the greater the lung inflation. A decided advantage is achieved in almost complete inactivity of the lungs during this gaseous exchange. The pressure can be controlled readily and varied either by changing the rate of oxygen or by altering the degree of immersion of the manometer. These variable factors, though of definite advantage to one experienced in this procedure nevertheless offer a drawback to the veterinarian who has but occasional use for this technic and does not have trained assistants available. The diffusion type apparatus also may be em-

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Fig. 1. The Demand Pneophone mounted on oxygen cylinder.

ployed as a simple, respiratory assistor in nonthoracic surgery by simply removing the manometer from the water container. In these cases, the animal has voluntary respiration and the rise and fall of the reservoir bag indicates the necessary flow rate of oxygen. Another consideration in the use of the diffusion type apparatus is the need to assemble the various component parts which offers a time and attention factor.

Fixed Cycle Resuscitation

The second method is the use of mechanical resuscitators such as the Emerson Pneolator, E & J, Heidbrink, Stephenson, and Stanton. These employ a predetermined and fixed cycling. In all of these the rate and depth of resuscitation are predetermined and, except for the Stanton, allow for little variation. It is imperative that, in operation of mechanical resuscitators, attention be given to the clicking of the apparatus to caution the operator when to switch over from the inhalation phase (used when animal is breathing voluntarily) to the resuscitation phase (when animal stops breathing) and to reverse this procedure when the animal again begins to breathe. The resuscitators utilize a positive pressure of 14 mm. Hg to force oxygen into the lungs via an inflated cuff endotracheal catheter and then reverses to breathe out to a negative pressure of 9 mm. Hg. The rate of respiration is determined by the volume of the patient's lungs and the time at which the pressure arrives at the blow-off level. The possibility of producing complete lung collapse during the negative phase, the diminished partial pressure of oxygen in the alveoli during the exhalation phase, the need of changing from inhalation to resuscitation, and the relatively high cost of this "suck and blow" apparatus limit their use to specific cases.

Burns Cycling Valve

In our work, we have resorted to the most satisfactory use of a third method, the Burns cycling valve combined with a demand valve, as in the M. S. A. demand pneophone. This equipment has proved most satisfactory in research laboratories for several years and adapts to veterinary practice well. The demand pneeophone, (fig. 1) utilizes intermittent positive pressure to assist impaired breathing, in asphyxia, and automatically follows the animal's normal breathing pattern. There is no suction used and the apparatus will change automatically from inhalation to resuscitation depending upon the condition of the animal. The valve was developed by Burns[8] for the Air Force early in World War II and has been described by him. Briefly its action is based on a pressure-sensitive diaphragm that shuts off the inlet of oxygen and allows exhalation when a certain pressure has been

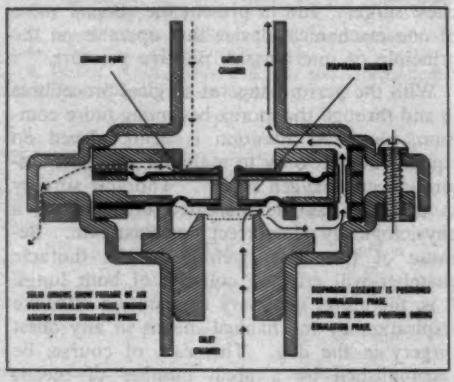

Fig. 2. Diagram of the Burns Cycling Valve. Courtesy Bulletin on Oxygen Administering Equipment, Mine Safety Appliance Co.

reached in the lungs. The reverse occurs when lung pressure drops to 30% of inflow pressure and thereby stops exhalation and again allows flow into the lung. Figure 2 is a diagram of the Burns cycling valve. As this diagram illustrates, the valve consists of an inlet chamber connected to the oxygen supply, an outlet chamber connected to the face-piece, and a diaphragm assembly separating the two chambers. Inlet ports provide a passage from the oxygen supply to the outlet chamber, and exports lead from the outlet chamber to the

air. The principal of operation is based on differential force in which a lower pressure on a large diaphragm area exerts a greater force than a higher pressure on a small diaphragm area.

During the inhalation phase the diaphragm is so positioned that the exhaust ports are closed and oxygen flows around the diaphragm assembly to the tracheal catheter, permitting the pressure to build up in the lungs. When this pressure is approximately 80% of that on the inlet side, the greater force moves the diaphragm assembly downward, opening exhaust ports and shutting off inlet flow.

Exhalation continues until the pressure on the outlet side drops to approximately 30% of the inlet pressure. At this point, the diaphragm assembly moves upward, closing the exhaust ports and opening the inlet flow.

Continued rhythmic operation of the valve indicates that oxygen is reaching the patient's lungs. Any obstruction in the air passages causes the valve to "chatter" audibly, providing an important safety feature.

The pneophone has several outstanding advantages over the other methods of respirators described. First, it requires no attendance. Once the patient is under control of the machine no changes or adjustments need be made for any condition that might arise. Second, this unit is the only completely automatic device of its type available. An important third consideration is the almost complete lack of maintenance problems since no motors or gears are used. Lastly, the diaphragm controlling the oxygen flow is pressure-sensitive and will allow the dog to control both the rate and depth of respiration when it is able to do so. However, when the patient loses respiratory ability from shock, anesthesia, respiratory arrest, opening of the thorax, et cetera, the pneophone takes over automatically. In this sense the dog is an anesthetist. It is important to note that the operation of intermittent positive pressure at no time allows the lung to be deflated grossly. Therefore the dangers previously described for "suck and blow" resuscitators are of no concern with the pneophone.

Dameron and Green[8] report the use of the Burns valve in over 150 dogs and six cats submitted for prolonged intrathoracic surgery. There was not a single death while the valve was in operation. They studied the partial pressures of carbon dioxide and oxygen in several animals while this type of respirator was in use and found both to remain within normal limits.

Fig. 3. The demand pneophone in use on a surgical patient, illustrating attachments to intratracheal catheter. Photographed in surgery of Dr. Stanley Wasman.

In our hands, the M. S. A. demand pneophone has been a faultless help. While no attempt has been made to record the number of times it has been used, we can safely report considerable experience with it in intrathoracic work in animal practice. Our routine procedure is to anesthetize the patient with an intravenous anesthetic of choice. The intratracheal catheter is inserted and carefully checked for proper location in the trachea. A close seal of the trachea is made by inflating the cuff of the catheter and the flexible connection of the pneophone attached to the catheter. From there on the equipment requires no further adjustment. In fact, only one adjustment is possible, that of the amount of peak-positive pressure. In our use this is set between 10-15 mm. of water and no further change is required. If portions of the lung become collapsed by manipulation during surgical procedures their rearriation may be hastened by increasing the peak pressure. This is not a necessary change, however. In no instance have we encountered difficulty associated with the pneophone. Some of the surgical procedures have required such prolonged and deep anesthesia that it would have been routine to expect serious respiratory depression. Because the device used is fully automatic the transition due to depressed condition from natural to mechanical respiration cannot be

noticed and the animal continues normal, rhythmic respiration. In fact, in several paients, after closure of the chest and disconnection of the equipment it was found that the respiratory center was depressed temporarily to a point of nonfunction. In these the pneophone was reconnected and allowed to maintain breathing for a short time until the patient automatically took over respiration from the machine. With other types of equipment these patients would have presented difficult problems.

In addition to its use in intrathoracic surgery the pneophone provides an excellent method of supplying oxygen for support of patients in any other surgery. Since it is automatic and requires no attention during operation it is ideal for use in depressed patients that would routinely benefit from oxygen and can be administered without any additional burden on the surgeon. It is also possible to place a closed ether bottle with a regulator interposed between the Burns valve and the tracheal catheter. By this means, continuous ether-oxygen anesthesia may be used, also without complete attendance.

Summary

Three methods of mechanical respiration are discussed. The M. S. A. demand pneophone is described and is presented to be superior to other equipment used for the same purpose. Its use in actual veterinary practice without a single case of difficulty is described and its value in oxygen therapy other than in chest surgery is presented.

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An Unusual Foreign Body in the Nostril of a Dog

H. W. HEISER, JR., D.V.M., Wichita, Kansas

On October 16, 1953, a six-year-old male Coonhound was admitted to the Kansas State College Veterinary Clinic, with the history that something was wrong with the animal's nose. The dog was alert and in good flesh. Appetite and stools were normal, as was the temperature, pulse, and respiration.

Questioning the owner revealed that the condition had existed for about seven weeks, during which time the animal had exhibited frequent attacks of sneezing, pawing at the nose, an unilateral nasal discharge, and on three occasions, unilateral epistaxis.

On a more-detailed examination, it was noted that no expired air was returned through the right nostril. A fetid odor and a slight mucopurulent discharge was present. Rhinoscopic examination revealed complete occlusion by foreign body approximately 5 cm. posterior to the external nares.

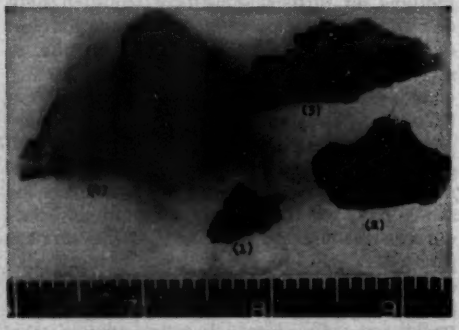

Fig. 1. Pieces of foreign body removed from dog's nostril, numbered in order in which they were removed. Enlarged 2X.

Clinical Procedure

The animal was anesthetized and alligator forceps introduced into the right nostril to grasp the obstruction which was noted to be hard. At this time it was thought that the foreign body was probably some sharp object which had entered the nostril while hunting, such as a twig or stem of woody weed.

Traction exerted with the alligator forceps freed a small piece of the obstruction which proved to be bone. Forceps were reinserted twice more and the bone grasped, and each time, with strong traction, a piece broke free and was removed. Hemorrhage was relieved by swabs of epinephrine hydrochloride (1:1000).

The remaining fragment was removed by heavier forceps after rotating the body to free it from its lodged site.

As to the origin of this foreign body, it seems doubtful that an object of such size and irregular shape (fig. 1) could have been introduced into the nostril through the external nares. The most likely explanation seems to be that the bone-fragment was present in the stomach, and that force of violent vomiting projected the bone through the posterior nares where it became wedged, and later imbedded in inflammatory tissue near the external nares.

Filariasis In A. F. P. War Dogs†

OSCAR D. SAN AGUSTIN, LT., V.C., A.F.P., Cavite City, Philippines

IN 1951, military dogs were imported by the Armed Forces of the Philippines and were employed immediately in tactical operations. They were found to be intelligent and valuable, but A.F.P. officers in the field complained that their canine assistants tired easily, had poor appetites, vomited blood, and suffered from bloody diarrhea. There were certain cases of sudden heart failure, which the officers thought was sunstroke or heatstroke. However, at the outset, this writer already attributed these ailments to filariasis, (*Dirofilaria immitis*), and suspected that this disease was prevalent in about 162 war dogs.

On November 14, the same year, autopsy was performed on the first mortality case. The presence of worms was found in the heart and the pulmonary artery. By actual count, there were 420 adult worms in a ball-like mass mixed with coagulated blood which filled the right ventricle of the heart. Extensive blood examinations were conducted on all dogs in camp. Sick animals were conditioned, clinical observations and autopsy records were correlated, and where the presence of microparasite were detected, antifilarial therapy (started in December 1951, and continued) was instituted. A survey of filariasis incidence revealed 130, or 80%, positive cases of filariaemia; only a few of which did not appear to suffer in health.

After one year and five months of antifilarial therapy, however, these war dogs responded favorably to the treatment, with more or less satisfactory results. Today, the performance of A.F.P. war dogs under actual battle conditions is documented in citations. Only a few tire easily or show sickly disposition; only rare cases of sudden heart failure have been reported.

During the one-year-and-five-month period of investigation (November, 1951 to April 1953), of the imported Japanese German Shepherds examined, 130, or 80%, were found positive for microfilaria. One hundred of them, or 61% were males, and 30, or 23%, females. Their ages ranged from three to four years.

†Presented at the Philippine Veterinary Convention, Pandacan, Philippines, April 23, 1953.

Of the eleven locally-purchased German Shepherds, two, or 18%, one three-year-old male and one four-year-old female, both local-born, were found positive after eight months contact with imported dogs. Of the Doberman Pinschers bought, four were likewise found positive after eight months contact with the Japanese dogs. Three of these Dobermans were males and one female, their ages ranging from four to six years. One four-year-old male Bulldog-Doberman *mestizo* also had filariaemia eight months after it was donated to the A.F.P. This was further confirmed by autopsy. Immatured heartworms were found lodged in the right ventricle of the heart. In 1952, Schnelle reported that canine filariasis, in the case of about 5,000 dogs, in the War Dog Reception and Training Dog Center at Fort Royal, U. S. A., constituted the greatest single disease problem.

Fig. 1. A.F.P. war dog. Japanese version of a desirable German shepherd.

An interesting case was that of a Japanese German Shepherd, 9½ months of age, owned by an army physician. It was brought to the camp's veterinary clinic for treatment of rickets but had filariaemia. According to the owner, the dog suffered from complete anorexia, bloody diarrhea, lassitude, emaciation, and anemia.

Dr. P. Villa, city veterinarian at the Manila City Pound, was consulted by this writer on canine filariasis incidence in Manila. The information was that the pre-war occurrence was 5%, post-war about 1%. It is probable that

the imported Japanese German Shepherds were carriers of filariasis in the Philippines, or at least, in the army dog camp, with common mosquitoes, such as *Aedes aegyptis, Culex fatigans,* and dog fleas serving as vectors. The control of these transmitters of parasitic infection was difficult due to the vast area to be sprayed or fumigated with DDT 10% solution, the supply of which was inadequate.

Diagnostic Procedure

Foley's direct blood smear method was adopted with slight alterations. This method afforded a rapid count classification; but while it was not accurate as a count, it nevertheless proved satisfactory, considering the large number of animals examined.

Fresh blood (approximately two drops) is mounted on a clean slide and covered with a glass slip, and examined under the low power. If the average count of microfilariae in five fields is numerous, it is taken as 4^+), an average of five microfilariae per five fields is considered 3^+; an average of one per five fields is 2^+; and if only one is found in five fields, it is considered 1^+. A negative classification is considered in the absence of microfilariae after examining an average of 25 fields, or the whole slide.

Symptoms

Clinical signs varied among the four case groups of 130 imported Japanese German Shepherds that suffered from the blood parasitic malady. The syndromes were as follows:

Case group I. Partial anorexia, emaciation, anemia, ascites, dermatitis, alopecia, eczema, tiring easily, bloody diarrhea.

Case group II. Arched back, sudden collapse, paresis of one or both hind limbs, cloudiness of anterior chamber of the eye, bloody diarrhea.

Case group III. Chronic cough, obesity, dyspnea, tiring easily, epileptiform convulsion, panting, bloody diarrhea.

Case group IV. Anorexia, laziness, panting, rabiform symptoms, occasional epistaxis, bloody diarrhea.

Treatment

Fuadin®[1] (sodium-antimony III bis-catechol disulfonate of sodium) was administered intraperitoneally, as recommended by Mark, for safety of patients. This shortened the period of canine filariasis treatment, following the intramuscular injections dose scale. Injection was given daily without omission and a rest period allowed on the seventh day. Blood examinations were made daily, also, while the series of injections was in progress. In case the animal remained positive after the first series, without mild or violent reactions, a second series of injections was given. If still positive, a third series or even a fourth series of injections was administered. Blood rechecking for microfilaria was continued until it became negative and a cure was effected. These antifilarial-treated animals were rechecked at two-month intervals for eight months.

Treatment with caricide®[2] (1-diethylcarbamyl-4-methyl-piperazine dihydrogen citrate) was used to treat 39 cases, or 24%, with nine, or 5%, manifesting adverse clinical reactions. There were, however, eight, or 5%, cases of mortality. Thirty-nine, or 100%, were rid of microfilariae. Complicating symptoms which developed were treated accordingly.

Supportive treatment also was adopted as recommended by Foley in the following form: Ledinac®[3], 1 tablespoonful b.i.d., or pervinal®[3] 1 tablespoonful a day, or liver extract compound injectable, 1 cc. every other day; aricyl®[3] 1%, 1 cc. injected every other day for five days, discontinued for two weeks or repeated; hi-deratol injectable 400,000 U.S.P. vit. D in 2 cc. ampules injected once a week; calcium injection 10%, 10 cc. daily as cases demanded; parenamine ®[4] 6%, 50 to 100 cc. subcutaneously as necessity demanded; multivitamin tablets t.i.d. Diet consisted of 50% beef cooked; 30% beef raw, and 20% milk a day.

Results and Discussion

Of the 130 war dogs blood-examined and intraperitoneally-treated with fuadin, 22 cases, or 13%, manifested adverse clinical reactions, such as bronchial asthma, eczema, anaphylactic shock, edema, anorexia, and vomition of blood. According to the findings and observations of 1st Lt. A. C. Ruiz, an expert trainer, it was the heartworms infesting the war dogs that affected their performance and caused them to be trained with difficulty. Poor health lowered their intelligence and made them tire easily. They became lazy and lacked aggressiveness. They even suffered from poor sense of sight, smell and hearing, sterility and abortions, susceptibility to disease, and poor stamina. In all of these findings, the writer concurs. Foley states the theoretical possibility of the occurrence of sensitization phe-

®[1]Winthrop-Stearns, Inc., New York, N. Y.

®[2]Lederle Laboratories Division, Pearl River, N. Y.

®[3]U. S. Vitamin Corp., New York, N. Y.

nomenon with anaphylactic shock due to disintegration of dead worms. According to H. W. Brown, mentioned by Foley, coronary occlusion may occur due to killed microfilariae. Of 37 dogs, or 22% mortality, 19 died in the field of huk operations. (Filariasis, 16; killed-in-action, 2; and chronic pneumonia, 1). The remaining 18 dogs died in camp (17 of filariasis and one of rabies). There were 105 dogs, or approximately 64%, that responded favorably to the antifilarial therapy, and were cleared of microfilariae. These findings were reconfirmed by Dr. P. G. Refuerzo, parasitologist, BAI, who blood-examined 79 dogs in which 17 cases, or 21%, were still positive for microfilairae. Of those negatively examined three, or 3%, when autopsied revealed presence of adult heartworms in the heart and pulmonary artery.

In groups I and II, 39, or 24% of the total 162 dogs (which included 32 cases, or 19% that previously underwent fuadin treatment), were retreated with caricide yielding the following results: Nine, or 3%, manifested adverse reactions, such as vomition of blood, bronchial asthma, edema, anaphylactic shock, complete anorexia. Of the eight or 3%, mortality cases, the following causes were observed: All died of filariasis, except one which was killed in an accident. All 39 dogs however, were freed from microfilariae from the peripheral circulations.

The results of both fuadin (intraperitoneal) and caricide (*per os*) therapy, however, were fairly favorable from the clinical standpoint. Thirty-two cases, or 19%, receiving fuadin had microfilariae four months later in their circulating blood, and were retreated with caricide.

Close clinical observations noted by this writer with either fuadin or caricide therapy, are consistent with the findings of Kingma whose successful canine filariasis treatment with fuadin eliminated the following symptoms: Lameness, coughing, and tiring easily. The adverse reactions manifested by animals during the course of therapy could be explained by Kingma, as to the toxic effect of the drugs used, and the disintegration of dead worms.

Summary and Conclusions

1. Of 130 cases which were treated with fuadin intraperitoneally daily for six days, with one day rest every seventh day, and an increase in the dose by 0.5 cc. at the eighth day of each series of every course of six injections, the minimum injections used were four and the maximum injections sixteen to effect eradication of microfilariae from the peripheral blood. Rechecks of blood examinations in locating the microparasites during the periods of four to eight months, revealed only 32 cases, or 19%, that were again positive.

Fig. 2. The author, Lt. O. D. San Agustin, V.C., A.F.P., holding a patient outside the post veterinary hospital. A portion of the unit in the background.

2. Of 39 cases treated with caricide at uniform dosages of 400 mg. tablets t.i.d., orally, 39, or 100%, were negative after two to three weeks treatment, and remained so after rechecks from four to eight months.

3. Of the 25 mortality cases autopsied which were negative for microfilariae in the peripheral circulation, having been previously administered antifilarial treatment, the presence of living heartworms in the right ventricle of the heart and the pulmonary artery and lungs was noted. Continuance of antifilarial therapy may completely eradicate the adult worms.

4. There is really still no dramatic cure or universally successful treatment for use in *Dirofilaria immitis* infected dogs. The need of close clinical supervision is most important during the entire course of therapy, in conjunction with the necessity of supportive treatment with the required rest and confinement, and the carrying out of a program of prevention and control of mosquitoes, fleas, and ticks.

5. In cases of heavily infected dogs the beneficial effects of this expensive antifilarial therapy are only temporary, as long as the drugs are administered to kill circulating microfilariae. Our observations do not lend evidence to sterilization of adult parasites though possibilities of reinfection are not discounted.

6. Antifilarial therapy never should be administered to heavily infected animals in poor

(*Continued on page 434*)

Amputation Of An Appendage In Chinchilla†

FRANK A. HAYES,* A.B., B.S., D.V.M., Columbus, Georgia

IN order of occurence, in all probabilities, amputation of a posterior appendage is second to cesarean section as a surgical effort with which the veterinarian concerned with a chinchilla practice may be confronted. The latter has been described in recent literature[1]. The following discussion has to do with necessary procedure for the correction of a second condition often indicated in a herd of chinchillas.

Although the surgical procedure is quite simple, it has certain hazards which differ from those that confront the surgeon handling other small animals.

There is also a variation in the anesthesia preferred, and hemostasis is greatly simplified.

Indications for the removal of an appendage of the chinchilla usually result from an injury. The nature of the rodent is such that it will attempt a "self amputation" where the lower limb has been subjected to excessive trauma, infection, et cetera. When a case of this description has been presented to the clinic, it is often of such intensity that there is little opportunity for successful therapy. The animal, in many instances, has "gnawed away" muscle tissue, nerves and vessels, in an attempt to remove the offending part. This, of course, indicates amputation as an exigency for the maintenance of life.

Preoperative

Where traumatic shock is imminent, surgery should be postponed if at all possible. The animal should be allowed to recover from initial trauma, thus facilitating the success of the operation. This precaution should be observed rigidly in working with chinchillas[2]. It has been demonstrated that a minimum of 24 hours should be allowed between initial injury and the commencement of surgery; there are many occasions where a longer period is advisable. At the same time, while waiting for predisposition to shock to subside, it may be found that surgery is unnecessary[3]. The rodent's power of healing is remarkable.

Fig. 1. Indication for amputation. Note extensive edema, discoloration, and necrosis of tissue.

After amputation has been determined as being a measure of last resort, the essence of preoperative precaution should be initiated. The administration of adrenal cortex extract®[1] (0.3 cc.), 24 hours prior to surgery, and immediately preceding the operative procedure, appears to be of considerable value[3]. The area is prepared in accordance with accepted methods for aseptic surgery.

A desirable stage of anesthesia may be accomplished by the employment of demerol®[2] given intramuscularly and procaine (1.5% aqueous solution) as a local and nerve block. Demerol is administered 30 minutes prior to surgery; 13 mg. for an adult animal is the desired dose. Local infiltration is made in the proximity of the anticipated incision, after which the necessary nerve block may be accomplished by injecting 0,25 cc. of procaine solution between the bone and musculature. The nerve block should be introduced approximately 1 cm. proximal to the anticipated muscle dissection.

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†From The Evergreen Chinchilla Ranch, Jessca, Inc., Columbus, Georgia.

*Research Director, Jessca, Inc., and Research Associate, Department of Pathology, Alabama Polytechnic Institute, Auburn, Ala.

®The Upjohn Company, Kalamazoo, Mich.

®Winthrop-Stearns, Inc., New York, N. Y.

Fig. 2. Site for nerve block.

Procedure

Of paramount importance, and the primary difference between amputative technic for chinchillas and that for dogs, is the site of removal. Where the dog is concerned, precautions are taken to avoid leaving an excessive stump, which may become a source of irritation. To some extent this holds true with the chinchilla; however, there are anatomical limitations involved which render a high amputation inadvisable. The anatomy of the rodent is such that a moderate stump must be left, else the animal will draw the remaining appendage within the conture of the loose skin, and healing becomes impossible. A brief examination of the gross anatomy will serve best to illustrate this important consideration. A slight deviation from the operative site to be described can prove embarrassing, especially where such a valuable animal is concerned[2]. It is rare that the injury will involve the limb proximally to the point where the leaving of adequate stump is impossible. The area of irritation usually is localized in the foot or hock.

For the average size animal, the site of incision should be approximately 3 cm. proximal to the hock or midway between the hock and stifle joints. Hemostasis is accomplished with a single rubber band tightly compressed around the leg in the region of the stifle. A pair of mosquitoe forceps are employed to facilitate the effectiveness of the rubber tourniquet.

The distal portion of the appendage is removed in the same manner as would be employed for this operation in any of the other domestic animals. Care should be taken that adequate muscle tissue and skin are available for the proper enclosure of the remaining tibia.

An interrupted suture (4-0 medium chromic catgut) has been found most appropriate for apposition of both muscle fascia and skin. The necessity of separate suture-lines in both muscle fascia and skin is, of course, apparent. The remaining bone should be engrossed completely within the muscle tissue.

Unless infection becomes evident, antibiotics are not recommended following chinchilla surgery. If adequate measures of asepsis are observed, in most cases recovery will be uneventful. The indiscriminate use of antibiotics often deranges the normal appetite[3]. Should postoperative complications occur, chloromycetin®[4] has been found to be effective[3]. The preferred dosage is 75 mg. daily, for a period not to exceed three days.

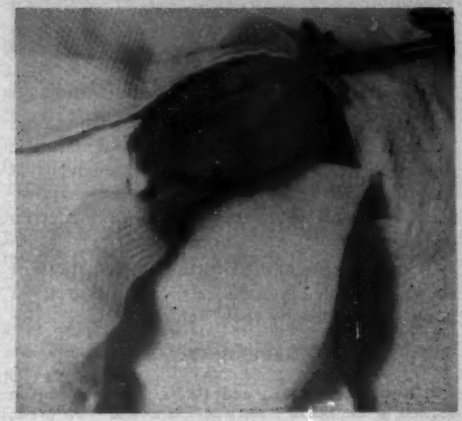

Fig. 3. Tourniquet and initial lateral incision.

Discussion and Summary

The paramount indication for chinchilla surgery reported in veterinary literature has been briefly mentioned. The operation has been pointed out as being a probable second in order of occurrence in this specific field of small animal surgery.

The preferred anesthesia is described, and the surgical maneuvers for the satisfactory accomplishment of the current endeavor illustrated. Various anatomical considerations also are mentioned, being of considerable importance in surgery of this type.

With a few minor alterations in standard

®[4]Parke, Davis and Co., Detroit, Michigan.

Fig. 4. Thirty days following surgery.

technic, little difficulty should be encountered in the removal of a limb from a chinchilla. The described technic is employed extensively at the clinic of Jessca, Inc., with the acquirement of highly gratifying results for the given operation.

It may be mentioned further that owners of these valuable animals are appreciative of good work done by their veterinarian..

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Trypsin Useful in Embolism

Studies by University of California scientists at Los Angeles reveal value of trypsin for dissolving fibrin clots within coronary vessels.

A group of eight dogs were embolized with repetitive doses of fibrin clots until definite electrocardiographic evidence of myocardial injury was observed. After a brief observation period each animal was given up to six intravenous infusions of 250,000 Armour units of trypsin in 250 ml. of saline over a period of eight days. Animals were sacrificed on the ninth day.

These studies revealed that trypsin had dissolved fibrin clots without damage to the infarcted tissue. Coronary vessels were recanalized and extent of infarction was decreased.—*Medical Research.*

Primates

Monkeys are used in research in surprising numbers. Although the larger laboratories generally raise their monkey replacements, a single dealer reports the importation of 12,500 rhesus (pronounced ré-sus) monkeys in a year. Recently 100 of these animals were shipped from India to New York in one airplane. The trip required but five days.

The menstrual cycle of the rhesus monkey, *Macaca mulatta*, is 28 days, the gestation period about 164 days. At birth, the young weigh from 300 to 670 gm. Monkeys are usually imported at one to three years of age. They weigh 1,500 to 4,000 gm. at that age. Adult males weigh up to 16 kg. All monkeys will bite and an adult male may be dangerous. Monkeys eat any food that man eats, except meat. They do well on some dog meals supplemented with fruit and vegetables in season. Of all fruits, bananas are the most palatable to primates—*from The Care and Breeding of Laboratory Animals edited by Edmond J. Farris.*

▼ ▼ ▼

Prepare a skeleton of a dog for reference to anatomical landmarks.—*Wade Brinker, D.V.M.*

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Canine Filariasis

(*Continued from page 431*)

condition. These are poor risks and are subject to adverse clinical reactions as a result of treatment which may prove fatal.

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Considerations In Formulating X-Ray Exposure Factors†

JOHN C. WATSON,* R.T., Minneapolis, Minnesota

THE discovery of *x*-rays by William Conrad Roentgen, just prior to the turn of the last century, is recognized as one of the greatest scientific discoveries of all ages. It also marked the beginning of the science of *x*-ray technology. The early manufacturers of *x*-ray equipment confined their work to static, high frequency, and coil-type transformers. Many different kinds and sizes of gas tubes also were manufactured, each with its own advantages. However, early equipment and tubes did not permit having a stabilized *x*-ray technic.

The gas tubes, for example, would have a wide variation in characteristics from day to day, depending upon fall in atmospheric pressure and allied conditions. Therefore, the early work in *x*-ray technology was primarily confined to radiography of extremities.

Advances that occurred which gradually permitted stabilizing the technic and permitting duplication of radiographs, were the development of the interrupter coil; second, the development of the nitrate base *x*-ray film; and third, advances in the manufacture of tubes. By the outbreak of World War I, therefore, a skilled technician had some hope of producing a fairly diagnostic radiograph.

Definition

A definition of a radiograph might be a pictorial record of an internal structure of an object or a part of the body produced by traversing the *x*-ray beam which has been selectively diminished by the absorption of the material or tissues through which it is traveling. There are several steps which go into the manufacture of a radiograph: (1) The factors necessary to produce contrast detail, density and visibility of detail in proper balance; (2) the proper classification of the body part; (3) methods of elimination of secondary radiation; (4) the alignment of the part and the *x*-ray tube; and (5) the processing of the radiograph in the dark room.

Radiographic detail is comprised of a mulplicity of deposits of black metallic silver which permit a varying translucency to the light of an illuminator. The individual silver deposits on a film have varying light translucency values known as tones. These tones are of varying degree and are due to the variable intensities of the emission radiation; in other words, the radiation that hits the film after it has penetrated the part. These varying tones, therefore, enable one to view the image detail, and these tones are known as radiographic contrast. The building of the radiograph, therefore, must first encompass the necessary factors to produce the best possible detail with proper contrast and proper densities. Knowing the factors that influence contrast, detail, density, and visibility of detail, are prime necessities if proper *x*-ray technic is to be evolved.

Detail

The factors influencing detail on a radiograph are numerous. First to be considered is motion. The patient must be immobilized, or lacking proper methods of immobilization, the film must be made with the highest possible speed; in other words, a short exposure time. In order to obtain a short exposure time, it is necessary to have equipment having adequate capacity.

I have noted, in visiting animal hospitals, that there is a strong tendency on the part of the doctors of veterinary medicine to purchase mobile *x*-ray equipment. This is a mistake, as most mobile equipment is of the 15 milliampere variety and has only a quarter of a second timer. Yet, the veterinarian is faced with a patient in which motion is bound to be a factor. He should have available equipment of at least 60 milliamperes and preferably 100 or 200 milliamperes capacity, with an electronic or an impulse-type timer which would permit exposure times as short as 1/60 of a second. This will help immeasurably in

†Presented at the 20th annual meeting of the American Animal Hospital Association, Minneapolis, Minn., May 6-9, 1953.

*Supervisor, *X*-ray Service, University of Minnesota Hospital.

stopping the motion of the patient. Other methods of immobilization are the use of anesthesia, and also the use of various types of immobilizing equipment such as compression devices, head holders, and sand bags. The choice of *x*-ray equipment also must be considered carefully due to other factors within the equipment which affect detail. The size of the focal spot of the *x*-ray tube is a factor; the smaller the focal spot, the better detail obtained on the radiograph.

The tube stand must be considered carefully because the focal-film distance, (the distance from the focal spot of the tube to the part to be radiographed) influences detail. The greater the distance, within reasonable bounds, the better detail that might be obtained. Therefore, the tube stand must permit holding the tube in such a fashion as to gain proper focal film distance. Detail is influenced also by the part-film distance. This should be minimized. The distance from the film to the part being radiographed must be as short as possible in order to obtain good detail. The selection of the proper type film for the radiographs is also important in obtaining maximum detail. Non-screen *x*-ray film is composed of much finer grains of sodium bromide in its emulsion than is conventional film. This finer grain will give vastly improved detail, the disadvantage being that it also requires a much longer exposure time. Therefore, the person making the radiographs must decide whether or not the animal can be immobilized for this longer period of time; otherwise additional detail that might be gained will be lost through motion. The proper selection of intensifying screens is important. The fine-grain type screen will again permit fine detail; however, at the sacrifice of much longer exposure times. Whether these screens are in contact with the film also influences detail.

Density

The density of a radiograph refers to the blackness of the area of the roentgenogram under consideration. In the final analysis, the desirable densities are concerned with the quantity of metallic silver deposited in the emulsion of the film as the result of: First, the primary exradiation exposure, and second, the processing procedure. A higher degree of density therefore, would give a dark film, and a lower degree of density would give a light film. The factors that affect radiographic densities are: (1) Milliamperage, (2) exposure time, (3) kilovoltage, (4) the focal film distance, (5) developing time and (6) the use of cones, diaphragms, and grids.

Contrast

Contrast refers to the differences between two densities as perceived by the human eye. Radiographic contrast may be divided into two types; short scale, or high contrast in which the difference between black and white on the film is quite sharply marked with little intermediary grays visible, and long scale or low contrast in which the brightness differences in tone values between densities become less. This will result in obtaining more grays between areas of little differences in density, and, whereas it does not produce as an attractive appearing film in many types of examinations it will produce more information.

The factors influencing contrast are, first of all, kilovoltage. The lower the kilovoltage, the greater contrast, or rather, the greater the short-scale contrast. As kilovoltages are increased, there is an increase in the so-called short-range contrasts. The selection, therefore, of the proper kilovoltage for any given part to be radiographed, is essentially the first step in establishing an *x*-ray technic. The use of a high milliampere seconds value with insufficient kilovoltage to penetrate a part that is being radiographed, will result in a marked increase in long-range contrast. The picture will have blacks and whites with few intervening gray shadows. Developing solutions also affect contrast. Warm developing solutions or excessive developing time will tend to increase contrast to an undesirable point. The use of auxilliary devices, such as filters, cones, diaphragms, grids, and cylinders, will, however, decrease density by minimizing secondary radiation.

A Bucky diaphragm is a device which absorbs the low penetrating secondary radiation. It is constructed of alternating strips of lead and wood, or magnesium framed and enclosed under the radiographic table. A mechanism moves this device across the cassette holding the film during exposure. A grid is a similar device which is stationary during exposure. Cones, cylinders, and diaphragms cut the secondary radiation by decreasing the area struck by the primary radiation. An unfailing rule of proper *x*-ray technic is that no film should be made without the use of a cone or diaphragm of proper size to minimize secondary radiation. This would result in a desirable increase in contrast, at no sacrifice of desirable grays.

Distortion

Distortion is the perversion of the true shape of the part as represented on a radiograph. The true shape cannot be exactly reproduced, since all structural features of the body are represented on a film as being in one plane; thus, distortion is present in every radiograph. However, it can be minimized by using certain precautions. First, keep the part-film distance short. Focal-film distance also has an effect on total distortion. The longer the focal-film distance, the less distortion; the shorter the focal-film distance, the greater the distortion. Improper alignment of the tube in relationship to the film and the part to be examined also will give this type of a distortion. The focal spot size again is a factor in distortion. The larger the focal spot, the greater the distortion on the radiograph. Recognizing the data on distortion is essential in some types of diagnosis, and therefore, the technician should understand the effect of distortion on producing radiographs.

Formula

I have discussed some of the things that affect contrast and density in a radiograph and also some of the factors that influence detail. Inasmuch as all *x*-ray technic is, in reality, a compromise to produce the proper balance of these factors, I think it well to point out the mathematical analysis of the factors that cause a lack of detail or radiographic unsharpness.

Geometrical unsharpness is caused by a short target-film distance, or by too great a part-film distance. These are the magnification factors causing unsharpness. Motion unsharpness, of course, deals with any motion of the patient or any vibration of the *x*-ray tube, or any motion of the film while exposure is being made. Screen unsharpness is due to a halation, or blurring, caused by the invisible light during the printing of the screen image onto the *x*-ray emulsion.

X-ray screens, commonly available, are divided into three classes; fast screens which have an unsharpness of 0.2 millimeter, par-speed screens or mid-speed screens which have an unsharpness of 0.15 millimeter, and slow-screens which have an unsharpness factor of 0.06 millimeter. It would be seen from this then, that the best detail would be available from the slow screens, all other factors being properly controlled. Lack of contact of the screens with the film during exposure time will give a wide variation in unsharpness. With these factors in mind, a mathematical formula can be evolved which can give you, in precise terms, the amount of unsharpness you can expect in any given radiograph.

Allowing U to equal total unsharpness in millimeters, F projected focal spot size in millimeters, d part-film distance in inches, D target-film distance in inches, M motion of the part in millimeters, S the screen blurring factor in millimeters, we can arrive at a formula: $U=\frac{dF-DM+S}{D-d}$. This is known as the sharpness formula. The distance factors in this formula may be expressed in inches or centimeters, provided that the same unit of measurement is used for both, and the formula includes all sources of radiographic unsharpness except vibration of the tube during the exposure, vibration of the film carrier, detail loss introduced by double emulsion films (when severe angulation is used), grain size in the *x*-ray film emulsion, and occasional detail losses introduced during processing.

If we had a 50 milliampere portable *x*-ray machine, with a stationary anode tube which had an effective focal spot of 4.2 millimeters, and wish to take a lateral lumbar spine, we then, using this formula, could arrive at the total amount of unsharpness which would be present if the film was taken at a target-film distance of 36 inches with part-film distance of six inches, using par-speed screens which have 0.15 millimeter blurring factor. Assuming that we can immoblize the patient so that no motion factor is available, we would then use this formula. Substituting the numerical values of this particular technic, we would find that the resultant radiograph would have an approximate one millimeter degree of unsharpness.

If we reduce the size of the focal spot of the *x*-ray tube to 1.5 millimeters, the most common rotating anode tube focal spot, and again use this formula, we would have reduced the unsharpness of a radiograph taken with similar factors of the same part to 0.45 millimeter. Therefore a reduction in the focal spot size (providing you can immobilize the patient for the longer exposure time necessary) would result in a radiograph with a much higher degree of detail than would be obtainable under the first set of factors.

To show the fallacy of making, for example, six foot heart pictures on small, self-rectified *x*-ray equipment, we could assume that the estimated speed of movement of the heart is five millimeters per second. Assum-

ing a set of factors of one-fourth of a second exposure time with a target-film distance of 72 inches and a part-film distance of five inches, using high-speed screens, and a focal spot of 2.1 millimeters on the *x*-ray tube, we would have an unsharpness factor of 1.7 millimeters. A good routine technic on a 200 milliampere *x*-ray machine could reduce the unsharpness factor to approximately 0.5 of a millimeter by shortening the exposure time to 1/20 of a second. These figures of 1.7 millimeters in the case of heart technic outlined, and 0.5 millimeter for the corrected technic of the heart, in reality represent that amount of motion on the film when attempting to read it. A differential of 1.7 millimeters is not easily tolerated when attempting to arrive at a proper diagnosis.

These formulas also allow us to analyze the advantages and disadvantages of stationary anode and rotating anode tubes. The stationary anode tube has the ever-present restriction of limited milliamperage per square millimeter of focal spot area. This means that you are unable, with a small focal spot, to use high milliamperage. Because of the fact that a certain number of milliampere seconds of exposure are necessary in any given radiograph, exposure times on all parts must be longer than would be necessary if the tube could stand the higher milliamperage. The rotating anode tube allows the effective focal spot to be changed rapidly through rotation of the anode during exposure, giving the effect of a small focal spot but enabling the discharge of *x*-ray producing electrons to hit a different area during the course of exposure. The advantage of this type tube lies in its small focal spot, use of high milliamperage, and short exposure times. Therefore, the rotating anode tube is valuable for use in examinations such as the heart, example cited, or gallbladders or stomachs or any part that would have a tendency toward peristalsis, or with any patient who could not be immobilized properly. The disadvantage of the rotating anode tube as compared to the stationary anode tube is strictly a matter of cost, the rotating anode tube ranging from $700 to $1000 as compared with $300 to $400 for the stationary anode tube.

We can conclude that detail is the most important quality in a radiograph. Consequently a proper understanding of the factors influencing detail, together with putting your available equipment to its best use, are important in establishing the *x*-ray technic in your department.

Formulating Charts

Generally speaking, we know the density of any radiograph image depends upon the amount of radiation reaching the film. This amount of radiation is, in turn, influenced by the distance the rays have to travel, the milliamperage used, kilovoltage used, and the duration of exposure time; also to the extent to which rays are diminished in intensity in passing through the part to be radiographed. In formulating *x*-ray charts so that you might, from day to day, duplicate results, knowledge of the factors which produce radiation is necessary. However, it is also necessary to realize that there are definite relationships between parts of the body and the amounts of exposure necessary to produce radiographs of these parts.

The method that I am about to outline is primarily for use with human patients. The relationships described also could be used for making a satisfactory radiographic chart for use in animal *x*-ray work. We have a total of 12 groups outlined in *x*-ray charts, and within each of these several subdivisions bearing relationships to one another involving exposure factors necessary to produce radiographs of these parts. The arrangement of these parts in various groups is due to similarity between the parts insofar as their radiopacity is concerned.

For example, in group 1, under A, we would have the anteroposterior, lateral, mentovertex, and vertexmento skull positions. Under sub-group B, group I, we would have the anteroposterior and lateral sella turcica. Under sub-group C, under group I, we would include a lateral, posteroanterior, maxillary, frontal, sphenoid and ethmoid sinuses, taken with the Bucky diaphragm. In the second major division, we would have under subgroup I, the maxillary, frontal, sphenoid and ethmoid sinuses without the Bucky diaphragm. Films of the mandible, the temporomandibular joints in the mastoids, and under Group III, we would have the anteroposterior and oblique films of the cervical spine, the anteroposterior and lateral shoulder, and other related parts.

We also would have similar classifications for all parts of the anatomy with groups XI being devoted to infant technics for all of the above listed groups, and group XII for children from two to ten years for the above listed groups.

We will assume that the *x*-ray machine for which we wish to establish this technic chart has a capacity of 35 to 90 kilovolts in

steps of one kilovolt, 20 milliamperes to 200 milliamperes, and that it is a full-wave rectified machine, having an exposure scale of 1/20 of a second to 20 seconds. Knowing these factors, we would next examine the tube to determine the size of its focal spots. Assume that this is a rotating anode tube with 1.5 millimeter focal spot. The next step in compiling the chart would be to study the tube rating chart for that given size focal spot in a full-wave rectified *x*-ray machine. Purpose of this is to fully understand the limits to which we could put the tube in any one given exposure, and therefore, be able to evaluate properly whether to take a film at 50 milliamperes for several seconds or whether the tube would permit us to take the film at 200 milliamperes for a much shorter exposure time.

Select an average individual; for example, a person who has an average build, with neither soft flabby tissues, or very muscular, dense, tissues; a person of average height and average weight. Then take trial films on this person. For example, start with the chest. A measurement of 20 centimeters through the chest, for the posteroanterior chest position, would indicate taking a film at 1/20 of a second, 200 milliamperes, 60 kilovolts. Also make a film at 64 kilovolts, at 68 kilovolts, and at 58 kilovolts. Then, under careful conditions, process these films and present them to the person who is going to read the films made on this machine. This person would then select the chest film that most nearly satisfied him insofar as contrast and radiographic density was concerned. Assuming the 1/20 per second, 200 milliampere, 64 kilovolt exposure met these requirements, set up the entire chart for the group IX division, which includes the anteroposterior, posteroanterior, lateral, and oblique chests, lateral and oblique esophagus, and similar parts. Establish the chart for this particular part because it is known that as centimeter thickness of a part increases, in the lower kilovoltages a spread of two kilovolts will maintain fairly average density. As the part gets thicker and the kilovoltage higher, it is necessary to go up to three kilovolts for added centimeter of part, and as the range of kilovoltage becomes still higher, to compensate for an increase of one centimeter in part thickness, it is necessary to go to four kilovolts. The wider spread in kilovoltage per centimeter of part is necessary as it has been established, empirically, that for a given centimeter of part thickness, at lower kilovoltages, an increase of two kilovolts ordinarily will supply the added density needed, but as the part becomes thicker, the kilovoltage spread, as the kilovoltages go higher must of necessity, become greater.

To proceed in establishing the *x*-ray chart, it would be necessary to take a radiograph of one part within each one of the groups. A change in the number of milliampere seconds exposure to produce the proper volume of penetrating radiation also would be necessary.

Forming Charts for Animal Radiography

To relate this method of establishing a technic chart for use on small animals, it would be necessary to group animals into classification using, as a criterion, the relative densities of tissue and bone between groups. I think it would be safe to say that the cat and rodent family could be considered one group.

A proper starting technic would be three millampere-seconds at 38 kilovolts at a 36-inch distance for a part measuring two centimeters. By using the part-measuring system, if your original radiograph was successful, increase two kilovolts potential per one centimeter increase of part until you reach 60 kilovolts potential technic. Your increase then would become three kilovolts potential per centimeter of part. Assuming you were using a 60 milliampere unit, you would obtain the three miliamperes per second with a timer setting of 1/20 of a second. Films in this particular group of animals would not require use of the Bucky diaphragm because the tissue densities involved would not create enough secondary radiation to become a problem. This also is true in the smaller dog classification. However, in setting up this technic for this group, it would be necessary to increase the millampere-seconds value to approximately twice that of the rodent-cat group and again use the per-centimeter-of-part-kilovolt-increase method.

As you get into larger, more muscular animals, increase the millampere-seconds values as well as the kilovolt values. This may present the problem of increasing amounts of secondary radiation hitting the film and causing undesirable densities known as radiation fog. It then becomes necessary to use the Bucky diaphragm or a wafer grid to absorb this undesirable density. When either of these aids becomes necessary, an increase in millampere-seconds must also be used. The ratio is approximately four times as many millampere-seconds as without the grid or Bucky diaphragm. This ratio is slightly variable depending on type of instrument used.

When it becomes necessary to use methods for controlling secondary radiation and increasing millampere-seconds values, the need for higher powered equipment becomes more urgent. For example, if you are obtaining a film at five millampere-seconds on a 15 milliampere mobile unit, you use one-third of a second; if secondary radiation becomes a problem you should use 20 milliamperes or a one and one-third second exposure. At one-third of a second, motion is a factor, which would probably become intolerable.

Conclusions

In conclusion, I would recommend that the beginning point and the most important step in establishing a technic would be proper selection of equipment. This equipment should include a rotating anode tube if possible; if not, a double-focus stationary anode tube with one small focus and one large focus should be obtained. I would recommend a minimum of 60 milliamperes and preferably a 100 milliampere unit, with an autotransformer permitting steps of two kilovolt potential from 40 kilovolt potential to 100 kilovolt potential. I would recommend a timer capable of accurately timing exposures from 1/30 of a second to several seconds in subdivisions of 1/30 of a second intervals for the first second. A Bucky diaphragm table is necessary if your department is involved in taking radiographs of parts over 15 centimeters in thickness.

These are the factors in equipment that will affect the formulating of a proper technic.

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Cardiac Arrest of One Hour Duration in Dogs Followed by Survival

The cause of death due to exposure to cold has been attributed to respiratory arrest. This hypothesis, however, can be abandoned since artificial respiration does not prevent death.

Another theory explained the cause of death due to low body temperature by a too-slow release of oxygen from the hemoglobin of the red cells, thereby causing death by lack of oxygen. This second theory also has become untenable because it could be shown that the tissues extract the normal amount of oxygen at body temperature as low as 17 C.

Thirdly, the rest of the heart activity has been made responsible for the death at low body temperatures. This remains to be proved.

We reasoned that the body temperature of non-hibernating mammals may be lowered below this temperature barrier of about 20 C. if one could substitute a mechanical device for the function of the heart and the lungs. Thus, by refrigerating the blood circulating outside the body in a so-called artificial heart and lungs it has been possible to lower the body temperature of anesthetized dogs to 0 C. The heart of the dogs stopped beating at about 13 C. but occasional contractions were recorded at 8 C. The heart was kept at complete standstill for an hour while the animal's blood was circulated, oxygenated, and refrigerated outside the body. On rewarming the blood, the temperature of the heart rose much faster than the temperature of the periphery of the body and at 10 to 15 C. normal heart beats returned. These beats increased in force and in rate as the heart muscle was warmed by coronary blood. After one-half hour of rewarming, the heart reached a temperature of 30 C. and the mechanical circulation and oxygenation were stopped. The heart and lungs resumed their normal function and all dogs survived without any detectable damage to the heart and the brain.

These investigations prove that heart failure must be the cause of death in prolonged exposure to extreme cold, since death was prevented when oxygenated blood was kept circulating through the body.

These physiological experiments have an important practical applicability to heart surgery, since all chambers of the empty, non-beating and oxygenated heart can be opened for one hour or more without danger of tissue damage, loss of blood or of air getting into the blood stream.—*Frank Gollan, Thayer Veterans Administration Hospital, Nashville, Tenn.*

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A.V.M.A. Seattle Convention Notes

THE 91st annual convention of the American Veterinary Medical Association which convened in Seattle, Washington August 23 last will live long in the memory of those fortunate enough to have attended, as a well planned and managed meeting. Additional pleasant recollections will be recalled of sincere hospitality of the host city. Those who could arrange sight-seeing trips, fishing expeditions, or other vacation activities either before or after the meeting found them most pleasurable. Temperatures were cool and, though skies were cloudy much of the convention week, no delays occurred in scheduled out-of-doors events.

Numbers in attendance were less than last year, as expected, because of long travel distance for many. Over 2,500 registered during the first three days of the meeting. Adherence to schedule of meetings eliminated loss of time and disappointment to those who wished to hear selected papers from various sections. Favorable comment was made of management features of the meeting as regards time schedules. The selection of subjects for discussions and speakers represented foremost authorities from all sections of the country.

Television programs were shown in the Metropolitan Theater auditorium on a single, large screen mounted on the stage. The facilities of this spacious theater were excellent for both speakers and audience.

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Social Events

The high spot in the week's activities was the salmon bake arranged by the local committee. Over 850 persons boarded buses for a ferry trip and drive along the beautiful Hood Canal on the Olympic Peninsula. Fresh salmon, clams, and other seafood had been prepared by special methods that were a gourmet's delight. Afterward the group was entertained by Indian dancers.

Alumni dinners were held at various hotels and the president's reception and dance at the Civic Auditorium.

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Pasture irrigation has accentuated the cattle and sheep parasite problem in Oregon and elsewhere.

President of the A.V.M.A.

Dr. A. H. Quin

Dr. A. H. Quin, Kansas City, Missouri assumed the presidency during the final general session of the Seattle meeting.

Doctor Quin, who holds the position of vice-president and director of the Professional Service Department of the Jensen-Salsbery Laboratories is one of the most widely known veterinarians in the United States. He will bring to the position a wealth of experience in many phases of veterinary activities including serious work and experience in public relations.

After his graduation from the Chicago Veterinary College in 1920, Doctor Quin entered general practice in association with his father at Creston, Iowa. Afterward he was employed in foot-and-mouth disease control work in California and as field representative for the Ft. Dodge Laboratories. He joined the Jen-Sal organization in 1942. During his professional career he served as president of the Iowa Veterinary Medical Association, chairman of the Public Relations Committee of the A.V.M.A., chairman of the Educational Committee of the Associated Serum Producers, and member of the Biological Committee of the U. S. Livestock Sanitary Association and the Missouri State Brucellosis Committee. He received the A.V.M.A. award in 1951 and the O.T.S. award in 1953.

The President's Address

In his address at the opening session President McCallam advocated an official system of reporting communicable diseases of animals, and government support of veterinary research programs. Both points have national economic significance. He reported also that membership in the national association increased by 628 during the past 12-month period for a total of 13,111, an all-time high membership record.

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New Officers for 1954-1955

Dr. A. H. Quin, president-elect at Toronto was advanced automatically to president and assumed that position when the gavel of authority was handed to him by retiring President McCallam during the closing ceremonies of the Seattle meeting. He became the 76th president of the A.V.M.A.

Dr. Floyd Cross, Dean of the School of Veterinary Medicine, Colorado A. and M. College, Ft. Collins, was elected president-elect by secret ballot vote. He will serve on the Board of Governors during the coming year and succeed Doctor Quin after the Minneapolis meeting in 1955.

Vice-presidents selected to serve are: Dr. Robert H. Wright, Dundas, Ontario, Canada, Dr. Myron G. Fincher, Ithaca, N. Y., Dr. McKenzie Heath, Auburn, Ala., Dr. T. Robert Phelps, Vancouver, Wash., and Dr. Frank B. Young, Waukee, Iowa.

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Nearly 3,000 Animal Hospitals in U.S.

A nation-wide survey conducted by the Hospital Committee revealed that there were 2,178 hospitals devoted exclusively to the care and treatment of small animals, 20 for large animals, and 476 combination facilities for care of all classes of domestic livestock and pets.

Most significant feature of this report was the notable increase in numbers of institutions constructed during the past eight years. During the 1930's only 314 new animal hospitals were opened in this country, whereas nearly 1600 new ones came into being between 1946 and 1953. The trend in providing suitable buildings and equipment to handle both large and small animals was also noted, thus making possible a complete veterinary service for farmers and pet owners of the communities in which these modern hospitals have been built.

Borden Award

Dr. Myron G. Fincher

Dr. Myron G. Fincher, head of the Department of Medicine and Obstetrics and director of the Ambulatory Clinic at the New York State Veterinary College at Cornell, Ithaca, New York received the Borden award of $1,000., medal and certificate. This award is sponsored annually by the Borden Company Foundation and administered by the A.V.M.A. in recognition for outstanding research contributing to dairy cattle disease control.

Born and reared on a New York farm, Doctor Fincher received his D.V.M. at Cornell in 1920, where he has been associated almost continuously since, first as instructor and subsequently as department head. During leaves he did breeding and sterility work and investigation on Thoroughbreds in Kentucky, and served for a time as acting professor of medicine at Ohio State University. More recently he has directed the highly successful bovine mastitis control program in New York, which work he summarized before delegates to the XV International Veterinary Congress held at Stockholm, Sweden last year.

Doctor Fincher has been consultant to breeders of purebred livestock for more than 25 years. His advice has been sought on all matters of disease and breeding problems of dairy cattle, and his observations and conclusions from tireless research have resulted in more than 50 original reports.

The selection of Doctor Fincher to receive national recognition honors a foremost authority, a peer among teachers, and a thorough and thoughtful practitioner.

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The major disease problem in all phases of poultry production is that group of morbid processes involving the respiratory system.—*C. W. Barber, D.V.M.*

XII International Veterinary Congress Prize

Recognition of the services of Dr. Francis W. Schofield, Guelph, Ontario, Canada was made in awarding to this outstanding teacher, research authority, speaker, and author, the XII International Veterinary Congress Prize.

Established in 1936, this award consisting of a certificate and cash in the amount of the annual interest or Special Fund #2, unexpended balance of fund raised for the entertainment of delegates to the International Congress held in New York City in 1934. He is the 18th recipient of this award.

Doctor Schofield, now 65 years of age, received his bachelor's degree in veterinary science at the Ontario Veterinary College in

Dr. Francis W. Schofield

1910 and remained there on the teaching staff until 1916, meanwhile earning his doctorate from the University of Toronto. He received an honorary doctor's degree from the Ludwig Maximillian University in Munich in 1950.

He taught bacteriology and hygiene in Seoul, Korea for four years at a school maintained by the Presbyterian Church, returning to Canada in 1921 when he was made director of veterinary hygiene at O. V. C. In 1931, he was appointed to the Department of Pathology and Bacteriology, and accepted his present position as professor and head of the Department in 1945.

In 1923, Doctor Schofield undertook research on sweet clover poisoning in cattle. He demonstrated the cause which has subsequently led to the development of coumarin, widely used as an anticoagulant by all branches of medicine.

Doctor Cross Elected President-elect

Dr. Floyd Cross

Dr. Floyd Cross, dean of the School of Veterinary Medicine, Colorado A. and M. College, Ft. Collins was elected president-elect by ballot vote. He is the third member of the veterinary staff of the Colorado school to head the national organization.

Doctor Cross has been a member of the Colorado A. and M. faculty since 1915, when he was appointed assistant professor of veterinary medicine. His appointment came shortly after his graduation from the school which he attended from 1910 to 1914.

His career was interrupted for military service in World War I which covered nearly a four-year period (January 1916 to September 1919), 23 months of which was spent in France. He was discharged as a 1st Lieutenant, Veterinary Corps.

After returning to his college, Doctor Cross was promoted to associate professor in veterinary pathology, professor of veterinary medicine and head of the department in 1935. In 1935, he also became dean of men. Subsequently he was named head of the Department of Pathology and Bacteriology and became dean of the School on March 1, 1948, succeeding the late Dr. I. E. Newsom when the latter was made president of the college.

Doctor Cross is known widely for his research work in animal diseases, particularly those common to feedlot conditions. He is the author of numerous papers, articles, and bulletins which have contributed to reduction of livestock losses. His cooperation, understanding of problems of producers, and close association with livestockmen in Colorado has earned for the school and himself the esteem of all livestock interests of the Rocky Mountain region.

In 1953, the Colorado Cattlemen's Association, with other interested groups, established a nonprofit foundation named the Floyd Cross Foundation for furthering research in disease of cattle.

Born in Berthoud, Colo., August 10, 1891, Doctor Cross was educated in Ft. Collins public schools. He played football at Colorado A. and M. and was captain of the 1913 Aggie team. He later coached freshman football.. He married Edith Culver, also of Ft. Collins, in 1919.

▼ ▼ ▼

A. V. M. A. Award

The highest award for meritorious, scientific service was presented Dr. Norman J. Miller, practitioner of Eaton, Colorado.

Cited by President McCallam was the work of Doctor Miller as a member of the Colorado

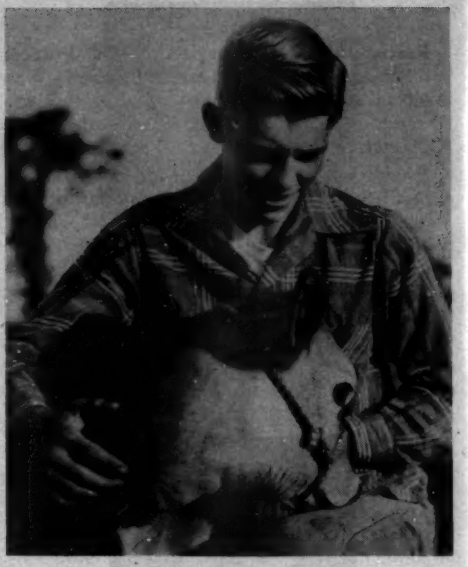
Dr. Norman J. Miller

postwar Public Health Planning Committee which was instrumental in establishing a veterinary division in the Colorado Board of Health for control of animal diseases transmissible to man.

Born in Fort Collins, Colorado, Doctor Miller studied at Colorado A. and M. College and received his veterinary education at the Chicago Veterinary College graduating in 1908. He has been in private practice in his state for 46 years. In addition to an extensive practice, he served as mayor of Eaton from 1932 to 1938, and since 1943 has been a member of the Colorado legislature.

The citation stated in part that, "Few men have contributed so unselfishly to profession, state, and nation." It is significant that his nomination for the A.V.M.A. award came from his fellow veterinarians in his home state.

Humane Act Award



Alan Campbell

A single-handed campaign against the practice of chaining cows at calving time won the 1954 national Humane Act Award of the American Veterinary Medical Association for 16-year-old Alan Campbell of East Corinth, Maine. In addition to the citation, Alan received a $100. U. S. savings bond.

The story behind this year's award illustrates keen observation of a youth and effective remedial action taken. Alan Campbell became concerned over the spectacle of new-born calves, injured or dying of neglect, out of reach of tethered cows. In a farm-to-farm canvass in his home area it was revealed that less than one-fourth the dairy farmers used maternity stalls; so Alan set out to correct matters himself. He made "The Curse of the Chain" his subject for an F.F.A. speaking contest, and won state and regional honors. Leaders among dairy farmers in his state were quick to urge that the practice be adopted universally for practical and profitable reasons.

Alan Campbell's fine work is a stimulating example deserving of the national recognition it received.

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Ants are the second intermediate host of the lancet fluke, according to report of the Committee on Parasitology. A need was voiced for more information that will lead to effective control of fascioliasis.

EDITORIAL COMMENTS

Ascariasis and Protein Digestion

The significant discovery that Ascaris infestation interferes with protein digestion and assimilation has been made at the Nutrition Research Laboratories of the Indian Council of Medical Research, Coonoor, South India[1].

The data were obtained on nine infested children that were hospitalized and maintained on a constant dietary intake of nitrogen, and nitrogen determinations were made on 24-hour stool specimens before and after removal of the worms. (*Ascaris lumbdicoides* was the only parasite present in the children selected for study, and all worms apparently were removed by doses of 8 minims of chenopodium oil in 1 oz. of castor oil. The numbers of worms passed varied from 17 to 40). In every case, nitrogen elimination was lower after removal of the worms. The average of 19 post-treatment determinations was 0.755 gm. N/24 hr. compared to an average of 1.315 gm. N/24 hr. for 21 pretreatment determinations. Two worm-free control subjects showed no change in fecal nitrogen after treatment.

The authors refer to the frequent occurrence of ascariasis among children who are physically and mentally retarded as well as underweight and malnourished, and to the high incidence of nutritional edema and dystrophy that is found among these children, yet they also observe that the "injurious effects (of ascariasis) if any (rarer complications excepted) are lightly dismissed, since, in the majority of cases, there is an absence of striking clinical manifestations".

Although the mechanism of nutritional interference was not determined, the authors guessed that "the intestinal hurry as a result of mechanical irritation" might move the semi-digested food down the gut with little time for proteolytic enzymes to act. It was not determined, however, that the interference is peculiar to protein metabolism.

From a veterinary standpoint, the hypothesis that interference with protein digestion may occur in ascariasis of swine, horses, and poultry offers an inviting explanation of stunting, unthriftiness, and feed-wastage. The work cited also indicates the need for inquiry into the broad area of nutritional interference by parasites.—*A. O. Foster, Sc.D.*

[1]Venkatachalam, P. S. and Partwardhan, V. N., The Role of *Ascaris lumbroicoides* in the Nutrition of the Host. Effect of Ascariasis on Digestion of Protein. *Trans. Roy. Soc. Trop. Med. and Hyg.*, 47:169 (Mar.), 1953.

QUESTION BOX

1. What advantages would accrue from use of an effective systemic insecticide for cattle grub control? See page 405.

? ? ?

2. Can culture of preputial washings be expected to establish diagnosis of trichomoniasis in bulls? What precautions must be observed for best results? See page 409.

? ? ?

3. What new swine anthelmintic has exhibited ascaricidal activity? See page 413.

? ? ?

4. What are the available methods for resuscitation in dogs? See page 425.

? ? ?

5. On what basis can a satisfactory x-ray exposure chart be developed for radiography? See page 435.

? ? ?

6. What is the possible nutritional interference mechanism caused by some intestinal parasites? See page 445.

? ? ?

7. Should medicated feeds be prohibited? See page 449.

? ? ?

8. How many animal hospitals are operating in the United States? See page 442.

? ? ?

Five Concepts of Everyday Living

Never flount your professional status, continue your quest for knowledge, be proud of your profession, but embrace the modesty and humility of the scientist, improve communications, and hold fast to ideals and principles.

Arkansas University graduates of medicine were urged by Dr. Jaques P. Gray, director of special medical services for Parke, Davis & Co., Detroit, Mich., to embrace these concepts as a part of their everyday lives. He said, "Rewards come in respect from those whom you serve".

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Wisconsin Poultry Disease Short Course

Thirty veterinary practitioners from all over Wisconsin participated in a three-day conference on poultry diseases at the University of Wisconsin, Madison, June 28, 29, and 30. The Departments of Veterinary Science and Poultry Husbandry of the University and the State Department of Agriculture cooperated in presenting a program that stressed the practical problems confronting the poultry industry and the urgent need of the poultry industry for on the spot *bona fide* veterinary service. Dr. C. D. Lee, extension poultry pathologist from Iowa, Dr. C. Ellis, veterinarian for Val-lo-Will Poultry Farm, Lake Geneva, Wisconsin and Dr. A. S. Rosenwald, extension poultry pathologist from California, assisted the Madison group in presenting up-to-date information on poultry diseases that will enable the veterinary practitioners to better handle their local problems. Most of those attending are included in the accompanying photograph.

What the Agricultural Press is Telling Your Clients

Brucellosis cost the beef and dairy industries alone $100,000,000. annually through sterility, loss of calves, and reduced milk production, states *Country Gentleman* for July 1954. Hog raisers lose an additional $5,000,000. every year.

The article referred to emphasizes features of the Brucella control program as they affect farmers. It advises dairymen, "Clean up or lose your market"; beef cattlemen, "Get purebred and commercial herds on a sound program to conform with present and upcoming laws governing interstate shipment of cattle." Readers are advised that eradication is possible through education, legislation, and cooperation of all elements of the industry. It is pointed out that state and federal control programs are moving rapidly in the interest of livestockmen and sounds the warning that failure to comply means financial loss through loss of markets for livestock products.

Front row (l. to r.)—Drs. C. C. Ellis, Val-lo-Will Farms, Lake Geneva, Wisconsin; A. C. Todd, University of Wisconsin; C. D. Lee, Iowa State College; B. A. Beach, University of Wisconsin; W. H. Patton, Wisconsin Division of Livestock Sanitation, Madison; Virginia Bradford, practitioner, Richland Center; C. A. Brandly, Chairman, Department of Veterinary Science, University of Wisconsin; C. W. Burch, University of Wisconsin.

Second row (l. to r.)—Drs. E. K. Prather, Manawa, R. L. Oettiker, Marshfield; Palmer Myhers, Eleva; J. W. Watts, Kenosha; Clifford Orton, Beaver Dam; H. J. Cook, Waukesha; A. C. Kelman, Waterloo; M. T. Szatalowicz, Stanley.

Third row (l. to r.)—Drs. S. J. Schilling, Kansas City, Missouri; H. H. Buchholz, Wilton; T. B. Patek, Randolph; Robert Curtis, Portage; A. E. Moats, Cedarburg; S. D. Sleight, Columbus; J. L. Welch, Clinton; Leo Whitehair, Madison; C. W. Seeman, Bagley, Minnesota; L. L. Otteson, Waunakee.

Back row (l. to r.)—Drs. P. L. Thompson, Argyle; Dale Kelly, Sauk City; J. L. Rogers, East Troy; F. W. Baker, Blanchardville; R. H. Hull, Black Creek; R. F. Bristol, Montfort; M. L. Kaster, Cuba City; H. J. Landskron, Larsen; Miles Agee, Chilton.

Three other practitioners who attended the conference are not shown in the picture. They are Drs. L. J. Gallagher, Baraboo; C. M. Heth, LaCrosse, and J. R. Fesler, Janesville.

Further Postal Rate Increases Debated in Congress

An effort to add three additional 10% increases to second class postal rates was debated in the House of Representatives on July 21. The proposal (HR 6052) was defeated. Increases in first-class mailing rates also were being considered to take up the huge postal deficit. The Post Office Department conducts a $20,000,000,000 business annually in over 40,000 offices.

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Incidence of Rabies in Cattle

Rabies is most prevalent among cattle along the east coast from New York to Florida, with the heaviest concentration in the southeastern part of the country. In New York state alone, 200 cases of rabies in cattle were verified in 1953 by the State Conservation Department. More than 1,000 cases throughout the nation were reported to the Animal Disease Eradication Division of the U. S. Department of Agriculture for the same period and this figure is regarded as a small percentage of the total cases that existed.

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Spread of Poultry Diseases

A newspaper clipping from Johannesburg, Union of South Africa, states details of an outbreak of epidemic tremors among poultry.

Epidemic tremors, according to this story, recently has been introduced into the Union through two different lots of hatching eggs imported from the United States. In this instance a disease native to this country is exotic in Africa.

Active control efforts are being made by authorities by inspection of all suspicious disease outbreaks. Growers are urged not to use for breeding purposes poultry having contact with infection. Eradication by slaughter is recommended. The disease has been identified on 40 premises to which infected chicks have been distributed.

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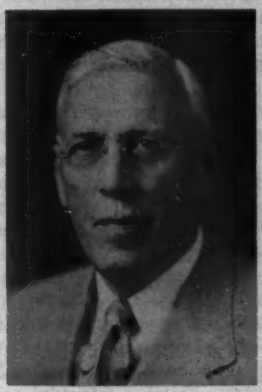
Dr. Earl Splitter, Department of Pathology, Kansas State College, Manhattan, reports that there are indications revealed by his research work that the carrier state of anaplasmosis may be relieved by the use of terramycin® injected intramuscularly at the rate of 5 mg. per lb., daily, for four consecutive days.

®Chas. Pfizer & Co., Inc., Brooklyn, N. Y.

Dr. Carl J. Norden, Sr., Dies Unexpectedly

Dr. Carl J. Norden, Sr., founder and chairman of the board, Norden Laboratories, Lincoln, Nebr., died August 21, 1954 at the age of 65 years. Death came unexpectedly from cerebral hemorrhage during convalescence from injuries sustained while on vacation in Idaho in July.



Dr. Carl J. Norden

Born in Sweden on December 18, 1888, Doctor Norden came to the United States as a boy. The family settled in Polk County, Nebraska. He was graduated from Kansas City Veterinary College, 1911, practiced in Nebraska City, Nebr., and later became associated with two leading veterinary supply firms. He was an officer in the Veterinary Corps, U. S. Army, World War I. At the close of the war he was appointed assistant state veterinarian for Nebraska, and in 1919 founded Norden Laboratories, serving as its president for 35 years. Closely identified with the veterinary profession through the years, he also served as president of the Missouri Valley Veterinary Medical Association and as secretary and president of the Nebraska State Veterinary Medical Association.

Survivors include his wife, Emma, and son, Dr. Carl J. Norden, Jr., a 1943 graduate of Iowa State College who is vice president and secretary of Norden Laboratories.

▼ ▼ ▼

Documented evidence of dollar losses is needed to sell importance of parasitism and significance of parasite control to livestockmen. *D. C. Boughton.*

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

Stilbestrol Implants in Lambs

A research project was conducted recently by members of the Animal Husbandry staff of Kansas State College to determine the effect of stilbestrol implants on lamb performance. One group received one implantation of a 15 mg. pellet at the beginning of the feeding period, another received a second pellet 70 days later. It was shown that those lambs receiving only one pellet had an increased rate of gain. Those receiving two pellets did not gain any faster than those receiving only one. It is significant that 12 of a total of 517 lambs receiving two implants died with symptoms that appeared similar to those observed in lambs affected with urinary calculi. On autopsy, there was found a considerable amount of swelling of the organs of the genitourinary system of males. All implanted lambs, both the one and the two-implant groups exhibited difficulty and distress in urination, with symptoms of swelling of the prepuce and perineal region. It is theorized that debris from swollen genitourinary structures may cause a partial blocking of the urethral tract and thus the difficulty and distress in urination.

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Pinkeye in Cattle

Faull and Hawksley in *The Veterinary Record* of May 29, 1954, report on infectious keratitis in cattle, associated with *Moraxella bovis*, an alleged factor in the etiology of pinkeye in cattle. Under treatment, the authors state: "Ophthalmic chloromycetin® solution (approximately 2.5 mg. per dose) or intramammary penicillin (50,000 I.U. per dose) instilled twice daily into the conjunctival sac, were equally effective if used in the early stages and before deep ulceration develops. The symptoms of lachrymation and photophobia disappeared within two or three days and focal corneal opacities faded soon after. Though neither of these antibiotics seemed to arrest the condition if introduced at a later stage, they may possibly have prevented the spread of infection to the deeper structures of the eye.

®Parke Davis & Co., Detroit, Mich.

Trichinosis a Human Health Problem

The Second National Trichinosis Conference held March 1, 1954 indicated that Trichina infection in man continues to occur frequently enough to constitute a significant human health problem. Disease incidence can be minimized by low refrigeration of pork products, by gamma irradiation, microscopic examination (in a measure), the methods suggested either are not feasible, or are too expensive for results obtained. Public education efforts to warn people of the dangers of consuming raw or incompletely cooked pork is frequently disregarded. Feeding raw garbage, containing pork scraps, to swine is a method of perpetuating this parasitic disease. Possibly legal requirement to cook garbage may be a helpful step. The trinity of garbage, swine, and pork are basic to the program for control of human trichinosis. The conference indicated the need for additional research for the development of further effective measures.

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Cattle Feed Formula Without Hay

At the Iowa Feeders Day, held at Iowa State College, a formula for feeding cattle was announced which excluded hay or comparable form of roughage. The only roughage in the ration was pulverized, dehydrated cob. The formula of the ration is four parts ground ear corn to one part supplement per ton—the latter consisting of 800 lb. cob powder, 400 lb. cane molasses, 556 lb. soybean meal, 100 lb. urea, 60 lb. bone meal, 40 lb. stilbestrol pre-mix and 4 lb. dry vitamin A. The steers gained 3.13 lb. day for 127 days at a cost of 18.5 cents. Another group of steers on corn, hay, et cetera, made approximately the same gain at the same cost, but there was the additional work of feeding hay.

▼ ▼ ▼

Recently we observed that, in the case of bites of people by poisonous snakes, oral administration of cortisone (25 mg. every six hours) seemed to be a valuable adjuvant treatment when given shortly after the injury took place. The usual antivenin, tetanus antitoxin, tourniquet, et cetera, were additional routine methods of handling.

POULTRY PRACTICE PROBLEMS

W. R. HINSHAW, D.V.M., Ph.D.
Frederick, Maryland

Use and Abuse of Medicaments In the Feed

Dr. P. P. Levine, New York State Veterinary College, presented a lecture, Use and Abuse of Medicants in the Feed, to the annual Cornell Nutritions Conference for Feed Manufacturers at their November 1953 meeting, which contained many pertinent facts about the present ubiquitous use of antibiotics, sulfonamides and other medicants in commercial feeds. The following abstract of his lecture published in *World's Poultry Science* (10:171, [Apr.-June], 1954), is reprinted below by permission of Doctor Levine.

"Chemotherapy for poultry disease control has brought along with its gain a number of disadvantages and additional responsibilities. Since the only practicable way of medicating large numbers of chickens economically is in the ration, the feed industry is forced to act as a dispensing pharmacist. The industry, therefore, must assume the same obligations that the ethical pharmacist has to the public, that is purity and potency of drugs used, proper compounding of prescriptions, careful review of dosage to prevent poisoning. Sometimes the trend toward pharmaconutrition has been so strong that it often appears as if the function of the feed in the sack is not to provide an adequate ration but to serve as a vehicle for the drug mix. Furthermore, whether by design or accident, the feed distributors often act as physicians and make the diagnoses as well as the pharmacists who compound the prescriptions.

"Specific medication will be effective only when the diagnosis is accurate. The symptoms in chickens produced by the acute type of intestinal coccidiosis caused by *E. brunetti* are practically the same as those caused by so-called "blue comb" disease. To treat the coccidiosis infection with muriate of potash (the treatment for "blue comb") obviously will be useless.

"The nature of the medication and its innate toxicity, particularly its safety factor, must be kept in mind. Where the factor of safety is narrow, the uniform distribution of the medicant in the feed is of critical importance. This involves problems not only of proper mechanical mixing but also the physical properties of the medicant. Acute deaths of fowls from ready-mixed medication are extremely rare. It does occur in cases of premeditated criminal acts, or by accident. Undoubtedly, subacute intoxication occurs more commonly and often these are not recognized. The recent demonstration of the unfavorable effect of 2-amino-5-nitrothiazole on the reproductive tracts of chickens medicated over a period of time is a case in point. The possible injury to birds by individual bird treatment or medication of water with drugs already in the feed is not far-fetched and actually has occurred.

"It has been shown that some medications mixed in poultry feeds are incompatible with certain nutritional elements in the ration, or with other medications placed in the feed. Para-aminobenzoic acid, which is advocated in some quarters for handling chronic respiratory diseases, is directly antagonistic to the action of sulfonamides commonly used for coccidiosis control. Flowers of sulfur, a coccidiostatic agent widely used in some sections of the United States interfers with normal bone formation in chickens receiving adequate rations. In such instances signigicant increases in vitamin D must be provided to overcome "sulfur rickets." Some of the sulfonamides have a definite effect on the calcium deposition for shell formation in laying fowls.

"An important factor in medicating through the feed is the palatability of the resultant mixture. One of the limiting factors in the use of tobacco dust as a vermicide in the early days was reluctance of the birds to consume the medicated feed. Similar difficulties have been encountered in the field with 2-amino-5-nitrothiazole in medication of chickens.

"The palatability and healthfulness of poultry meat and eggs originated from medicated poultry for humans cannot be overlooked. Fishy flavor of meat due to cod liver oil feeding of turkeys is well known. The awareness by federal agencies of undesirable physiological and toxic effects on humans resulting from ingestion of harmful substances is well known. Antibiotic medications sold to dairy farmers and used promiscuously has been sharply criticized when detectable amounts were found in the milk. Were it not for the fact that high

(*Continued on page 452*)

PUBLIC HEALTH

JAMES H. STEELE, D.V.M., M.P.H.
Atlanta, Georgia

Contagious Ecthyma

Contagious ecthyma or sore mouth of sheep is caused by a virus approximately 180-200 millimicrons in size. It is a common disease in the United States, England, and Australia, and probably occurs in other parts of the world. Man becomes infected from handling diseased sheep or live virus vaccine. The incubation period in man is from four to six days. In studies carried on by Pask[1] in Australia it was found that attempts to transmit contagious ovine ecthyma in man were successful in 23 of 46 trials. The more severe lesions develop after an incubation period of four to six days, reaching maximum intensity in 18 to 21 days. There was no constitutional disturbances in these cases. Infection appears to have been followed by solid immunity in 11 of 12 human subjects.

California public health authorities recently reported three human cases. One occurred in a ranch worker who had been immunizing sheep for the disease. It was stated that blister-like lesions appeared on the man's wrist and three days later lymph nodes of the right axilla were painful. No other symptoms were noted. Two other human cases were reported in laboratory employees, one who worked with the virus in preparation of vaccine, and the other who skinned sheep used in the preparation of vaccine. Both of these men developed lesions on the fingers, particularly around the finger nails. There was a generalized lymphangitis of a mild nature followed by a recovery without complications.

Another human case recently has been reported from New Mexico. There are reports of investigators that lesions may occur on other parts of the body, including the genitalia.

Veterinarians should caution farmers, ranchers, and shepherds about handling diseased animals and live virus vaccine. The virus is known to be quite resistant and can overwinter in barnyards, stables, and shelters. It is susceptible to heat. Persons handling infected animals should wear rubber gloves and protective clothing. This clothing should be removed and washed after work among infected animals or on contaminated premises is completed.

[1]Park, V. M., *et al.*, Transmission of Contagious Ecthyma from Sheep to Man. *Med. Jour. Aust.*, 2:628, 1961.

Animal Schistosomiasis*

Schistosomiasis is considered one of the major public health problems of the world. Fortunately, it is not found in the United States. It is prevalent in some of the West Indies and on the north coast of South America. The major endemic areas are: The Nile Valley, central Africa, East Indies, southeastern Asia, Philippines, and Japan. The three major types in man are *Schistosoma hematobium*, *S. mansoni*, and *S. japonicum*. The disease is spread by the passage from the host of infective eggs which must reach water to develop. There the eggs hatch into miracidia which develop into cercariae in snails. The parasite leaves the snail as a cercaria, which has the ability to penetrate the skin of the definitive host. After penetrating the skin, it reaches the circulation, is carried into the liver, intestines, or bladder, where it develops into an adult fluke, and the cycle continues.

Of the three species that affect man, *S. japonicum* will cause disease in cattle, dogs, cats, and various other small animals. In these instances the animals must also be considered as sources of infection for man. To control the disease effectively, infected animals must either be treated or destroyed. It should not be forgotten that man is still the principal source of infection for himself.

There is another group of schistosomes which is usually found only in animals. This includes *S. spindalis*, *S. bovis*, and *S. douhitti*. There are others found in birds. Investigators of these infections have raised the question of whether animal schistosomes are infective for man. The eggs of *S. spindalis* and *S. bovis* have been found in human feces but under such rare conditions that one would not consider them to be public health problems, but the recovery does imply that man is not absolutely resistant toward animal schistosomiases. In North America, the schistosomes of mice (*S. douhitti*), beaver, and birds, cause a dermatitis in man which is commonly referred to as swimmers itch. The dermatitis is the result of the penetration of the skin by cercariae. The cercaria are unable to penetrate any deeper than the skin and the result is an inflammatory process which destroys the worm at that point.

*Kagan, Irving G., Experimental Infections of Rhesus Monkeys with *Schistosomatium Douhitti*. *Jour. Inf. Dis.*, 93:200, 1953.

CLINICAL REPORTS

Polyethylene Sponge in Perineal Herniorrhaphy

R. B. KOGER, D.V.M., Joplin, Missouri

Perineal hernia is a condition common among aged male dogs. Correction is often difficult and laborious inasmuch as facia of the region is flimsy and friable. An excellent description, factors responsible, and operative technics is given in Canine Surgery[1]. The purpose here is to describe a modification and improvement of known methods by the use of a mechanical aid.

The polyethylene sponge† used in this method has been used widely in human plastic surgery, especially in the thoracic cavity following thoracopnemoplasty. It can have rather extensive use in veterinary medicine as an implant following extirpation of the eye to prevent sinking of the tissues, or in any cavity to add a molding effect where sinking might occur. The sponge is nonirritating, nonabsorbable, and inexpensive. It can be molded or cut and shaped to fit any cavity. It is readily sterilized and neither supports bacterial growth nor is decomposed by bacteria or molds. Full directions for processing the sponge prior to use are included with the package.

The surgical procedure is a modification of the described methods. The patient is anesthetized with any method of choice. In my practice, one of the anesthetics of the short duration type is preferred in poor surgical risks. If a loop of intestine or a diverticulum of the rectum is contained in the sac, it is cleaned of fecal material mechanically or by enema. Should the bladder be reflected, it is emptied by catheterization or by sterile puncture and drainage. Parts are returned to their normal positions if possible. The rectum is lightly packed with cotton. The field is prepared for aseptic surgery by standard methods. The patient is placed on the operating table in ventral recumbancy with the hind legs tied to the table, which is tilted to an angle of 45° or more.

A liberal skin incision is made over the center of the herniated area. This is deepened by blunt dissection until the ring is disclosed and the important structures identified. Excess fat and adherred omentum may be trimmed away. One purse string suture of sterile no. 50 cotton is placed as deep as possible in the ring to prevent the sponge from slipping into the abdominal cavity. The sterile formed sponge (cut slightly larger than the ring) is implanted in the hernial cavity. Three to five cotton sutures are placed in mattress fashion drawing fascia over the sponge to hold it in place. The skin is then sutured with nonabsorbable material. Penicillin (300,000 to 600,000 units) is injected directly into the sponge. As a rule, castration is advisable, but if the owner refuses, the patient may be given stilbestrol at the rate of 5 mg. per 20 lb. body weight twice a week.

Aftercare consists of daily therapeutic doses of antibiotics for three to five days. The evacuations are kept soft by the use of mineral oil *per os* or gentle enemas daily to prevent straining. Skin sutures are removed in seven days.

By the use of the polyethylene sponge much laborious suturing is eliminated. A firm union is achieved by the cicatrical tissue lacing into the interstices of the sponge. Careful fitting of the sponge to the size of the cavity results in a neat rounding of the area without objectionabble puckering, frequently evident by other methods.

REFERENCE

1. Blakely, C. Lawrence, Canine Surgery, Evanston, Ill., American Veterinary Publication, Inc., 1952, pp. 329-341.

† † †

Aureomycin in the Treatment of a Bacterial Infection in Mink

ROBERT L. BURKHART,* V.M.D., and GRACE ALLEN,* M.S., Pearl River, New York

In the early winter of 1953, an outbreak of disease occurred on a mink ranch of about 2,000 breeders. Inappetence and buccal hemorrhages were the visible symptoms. Affected mink lost weight rapidly and death followed in seven to ten days. Mink died at the rate of about two a day for a three-week period, with total losses of 52 animals.

Three dead mink and one acutely ill were submitted for laboratory examination. Autopsy revealed acute congestion of lungs, pale livers with small white nodules, pale kidneys with

†Ivalon Surgical Sponge—Formulation M. Manufactured for Clay Adams Company, New York, N. Y.

*Lederle Laboratories Division, American Cyanamid Company.

petechial hemorrhages of the cortex. On bacteriologic examination of three animals, no significant organisms were isolated from one, and only *Erysipelothrix rhusiopathiae* were isolated from the remaining two. The source of the erysipelas organisms must remain purely a matter of conjecture. It is known that this organism is the cause of a disease in turkeys, and can be found frequently on fresh- and salt-water fish, either or both of which may constitute a portion of the ingredients of mink feed. Analysis of the feed and bacteriologic examination would have revealed the presence or absence of the organism, but, by the time the disease outbreak was observed, such examination was not possible.

Forty mink were visibly ill at the time treatment was started. As chlortetracycline† had been reported to be active against the erysipelas organism, chlortetracycline soluble†† was added to the drinking water at the rate of 5 level teaspoonfuls per gallon (1 gm. chlortetracycline), which was kept constantly available to the mink in their drinking cups for five days. Fresh solutions were prepared each morning. Improvement was noted in the majority of the mink within two days. After the five-day treatment, only six additional mink were lost, and no further deaths occurred after ten days from the completion of treatment. No new cases developed in other mink on the premises.

The prompt clinical response and uneventful recoveries obtained in this outbreak suggest the use of chlortetracycline in the treatment of infections caused by organisms susceptible to this antibiotic. Administration in the drinking water is simple and obviates the need for individual handling of animals.

The authors wish to express their appreciation to Mr. Irving Pinchuck, Manager, Ramapo Mink Ranch, Spring Valley, N. Y., for his cooperation and assistance in the conduct of this trial, and to Mrs. D. Budd for assistance in the preparation of the manuscript.

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Medicaments in Feed

(*Continued from page 449*)

concentrations of antibiotics are so costly, even more generous use of these substances would be made by poultrymen. As matters stand, enough antibiotics are sold without justification anyway."

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†The trade-mark of American Cyanamid Company for the antibiotic chlortetracycline is aureomycin.
††Aureomycin chlortetracycline soluble (tinted) (unrefined), Lederle.

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▼ ▼ ▼

Calf Enteritis

(*Continued from page 422*)

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ABSTRACTS OF LITERATURE

Solution to Malpractice Suits

The following is an adaptation of an article originally appearing in the *Journal of the American Medical Association*[16]. Modified to include the veterinarian, it holds importance for all medical professions.

While an ethical attorney first will investigate to see if he has a case, an unethical one may proceed without evidence, feeling that all veterinarians carry malpractice insurance or can well afford the amount recovered. He may gamble on settlement of an unjustified case, knowing the practitioner will wish to avoid unsavory publicity.

Even if malpractice charges are defended successfully, the profession suffers as a whole, and the individual may be ruined, all to the disconcern of plaintiff, the plaintiff's lawyer, the court, and jury. Unfortunately, there is no procedure to compensate for wrong that does not vilify individual and profession.

Because the charging attorney is in his medium, and the veterinarian entirely out of his element, he has every opportunity to be a scrapegoat. To the practitioner, the courtroom means wasting valuable time to proffer a restricted opinion based on inadequate observation, for persons who can not understand and probably will not believe him. His character, qualifications, veracity, and creditability will be vicariously attacked, and even though lily-white, he will leave the room wondering if his years in school, his honest attempts to render a service, his personal honor are, or ever will be, worth anything to him or anyone else. Personal indignities at the hands of a clever trial attorney may be great. The defendant is at a distinct disadvantage and meanwhile he must neglect his patients.

Because ethical, conscientious, and honest medical witnesses are reluctant to appear, a veterinary witness may be pitted against a mercenary, professional witness. The former is apt to emerge second best because he is not as "courtroom wise". It is unlikely that the ethical, wide-awake practitioner will appear in court a second time.

Remedies for this unsatisfactory situation would answer these questions: (1) How can recovery for injury be effected?, (2) how can recovery be expedited quickly?, (3) how can honest testimony be procured?, (4) how can the ethical practitioner be assured there will be no whitewashing or mollycoddling of incompetence?, (5) how can the profession be protected from unwarranted attacks and unsavory publicity? (6) how can procedures be modified to conserve court and professional time?

A plan of confidential procedure prior to filing action could be formulated that would determine the merits of the case. If justified, a stipulation of fact would be prepared by a board instituted to examine medical facts. This would have a rotating membership of practicing attorneys and veterinarians approved by their associations.

The only feasible recommendation at this time would be for serious consideration of these proposals. If leaders in both professions, representatives of insurance companies, members of the judiciary, specialists in the academic fields involved, and representatives of the public were given opportunity to consult on this matter, a satisfactory solution could be evolved.

[16]Shindell, S., Medicine Versus Law: A Proposal for Settlement. *Jour. Am. Med. Assn.*, 151:1078 (Mar. 28), 1953.

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